Established 1916 as
OIL WEEKLY

WORLD OIL

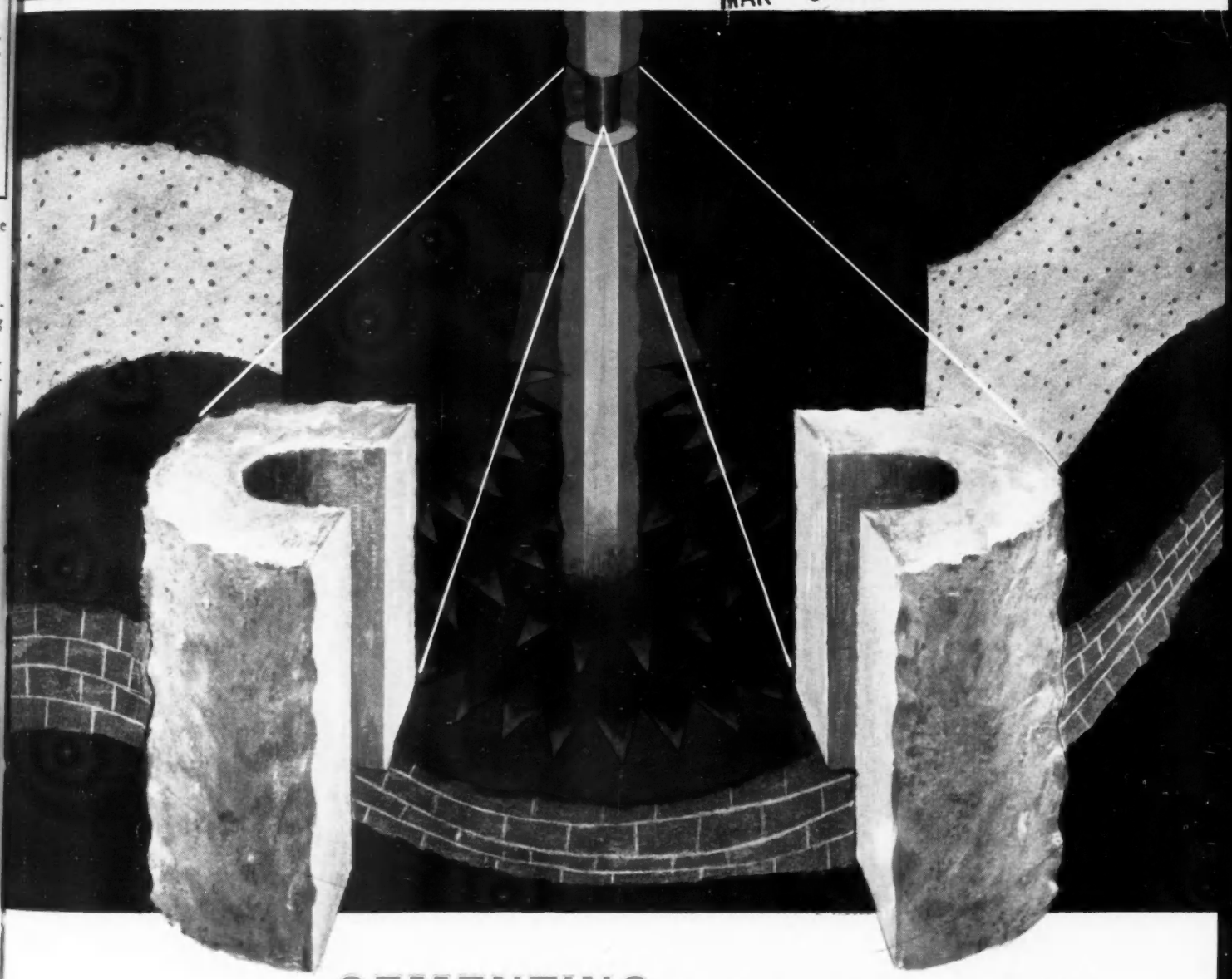
SPECIALIZED FOR EXPLORATION, DRILLING, PRODUCING,
PIPE LINE OPERATIONS AND MANAGEMENT

MARCH, 1954

SPECIAL REPORT on permanent-type well completions . . . Production Section

Subscription Price $2 Per Year
Price This Copy 50 Cents

UNIV. OF MICHIGAN
MAR - 8 1954

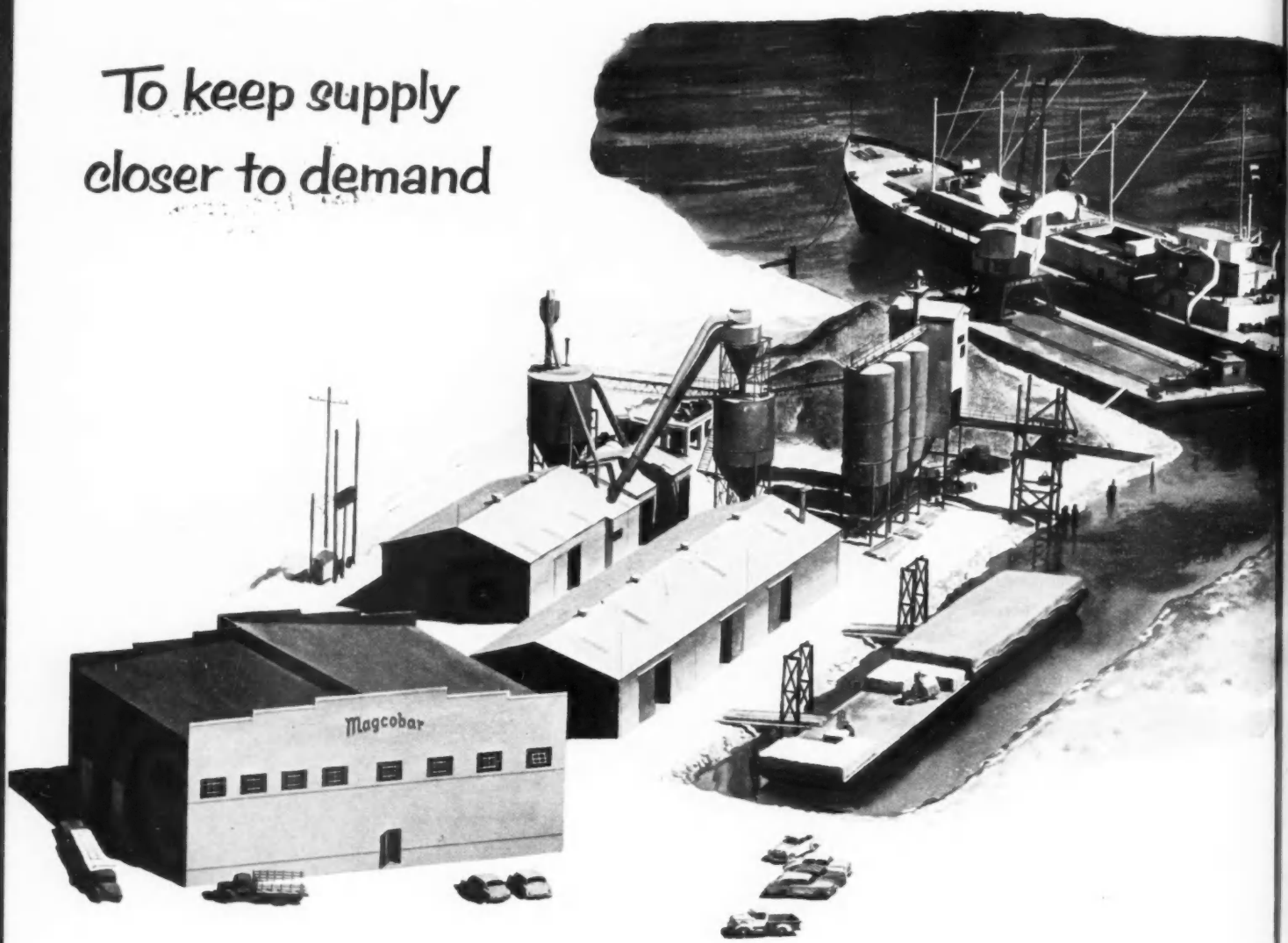


CEMENTING is the complement of drilling

Drilling a hole through water-bearing formations destroys the natural barriers that held these waters captive. And that creates cementing's job . . . to restore these barriers as well or better than before, and to form a bond of cement between wall and casing as though no hole were there. When drilling is done with cementing in mind both jobs are more successful. And more operators wisely regard Halliburton cementing as the complement of drilling.

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

To keep supply closer to demand



Magcobar has opened a new Barite plant at New Orleans

Located on the Industrial Canal at New Orleans, this new Magcobar barite plant is strategically located to draw raw materials from throughout the entire world to meet future needs of the drilling industry. Close to Gulf Coast drilling activity on land and offshore, this new plant will enable Magcobar to supply highest quality barite to the industry at minimum transportation costs. This plant is another step by Magcobar in supplying the oil industry with highest quality drilling mud at the lowest possible cost. When you need mud, call your Magcobar Dealer. There are more than 400 in the United States and Canada.

Magcobar
Complete
DRILLING MUD SERVICE
DEALER

MAGNET COVE BARIUM CORPORATION
ONE OF THE DRESSER INDUSTRIES
HOUSTON, TEXAS

MAGCOBAR • MAGCOGEL • HIGH YIELD • XACT CLAY • SALT GEL • MY-LO-JEL
MY-LO-JEL PRESERVATIVE • DRISCOSE • MUD FIBER • CELL-O-SEAL • FIBER SEAL
MAGCO FIBER • LEATHER-FLOC • MAGCO MICA • JEL-OIL MUD • JEL-OIL "E"
"E" CONCENTRATE • NOHEEV • TANNATHIN • RED OX LIQUID • ALKATAN
QUEBRACHO • KEMBREAK • MAGCOPHOS • CHEMICALS

WORLD OIL

Established 1916 as The OIL WEEKLY

Vol. 138, No. 4

March, 1954

UNIV. OF MICHIGAN

MAR - 8 1954

EAST ENGINEERING LIBRARY

CURRENT OUTLOOK SECTION

Looking Ahead ... 63
Editor's Page ... Warren L. Baker 65
Natural Gas Search Booms in Intermountain West ... Bob Bernick 66
Better Health for Executives ... Dr. B. B. Reeve 69
Management Problems and How They're Solved ... Edgar Kraus 72
The Courts Say ... Joseph M. Shelton 77
Sizing Up a Job Candidate ... Auren Uris 78
The Big Moment . . . for Major B. A. Hardey ... 83
The Changing Panorama ... 84
Report from Observatory ... Ray L. Dudley and Warren L. Baker 88
Petroleum Trends in U. S. ... Cecil W. Smith 90
News Analysis ... 92
The Month's Completions ... 98

EXPLORATION SECTION

Southeastern Colorado: Gas Developments Enhance Prospects ... Anthony Gibbon 101
Contouring Important in Subsurface Structural Mapping ... E. J. Handley 106
Exploration Starts Year at High Level ... Cecil W. Smith 108
U. S. Discoveries in January ... 111

DRILLING SECTION

New Downhole Instrument ... C. R. Canfield 121
WORLD OIL Graphics ... 126
How the Ohio Oil Company Drilled the World's Deepest Well ... Gilbert M. Wilson 128
How to Do It—Drilling Hints ... 152

PRODUCTION SECTION

Permanent-Type Completions Come of Age ... J. E. Kastrop 167
WORLD OIL's Special Report on Permanent-Type Well Completions ... 168
- How to Prepare the Well ... 172
- Working Over Permanently Completed Wells ... 185
- Washing Out Sand ... 186
- Squeeze Cementing Data ... 190
- Abnormal Pressure Wells ... 198
- Use of the Plug Cutter ... 200
- Dual Permanent Completions ... 203
- How Much Can You Save? ... 208
- What the Future Holds ... 210

How to Do It—Production Hints ... 212

PIPE LINE SECTION

How to Detect and Test for Gas Engine Blow-by ... James H. Caldwell 221
Perils of Pipeline Pete ... 224
Rules of Thumb for the Pipeliner's Notebook ... 226
What's Happening in Pipe Line Construction ... 228
How to Do It—Pipe Line Hints ... 230

INTERNATIONAL SECTION

The Story We 'Killed' That Men Might Live ... Ray L. Dudley 239
Oil Has Come Up From Down Under ... 240
Middle East Oil Still Growing ... Robert E. Spann 241
Cuban Hopes Center on Wildcat ... Anthony Gibbon 248
Mexico's Busy ... 250
Peru Looks Seaward ... Dr. J. E. Rassmuss 251
What's Happening Among World Oil Men ... 254

DEPARTMENTS

Who's Meeting Where ... 58
Letters ... 60
What's Happening Among Men in the Industry ... 257
What's Happening Among Industry Associations ... 262
What's Happening Among Service and Supply Men ... 264
Trading Post ... 268
New Books, Maps and Movies ... 269
Squeaks from the Bullwheel ... 270

NEW EQUIPMENT

What's New in Equipment ... 275
New Catalogs and Equipment Literature ... 279

Advertisers' Index ... 280

UNIVERSITY OF MICHIGAN LIBRARIES

a quick look at WORLD OIL THIS MONTH

BUSY OIL MEN: To help you put first things first, scan these time-saving digests on this and the following pages, checking ☑ those you want to read first.

CURRENT OUTLOOK

☐ **The Intermountain West** is looming large as a possible natural gas supply base for fuel to the West Coast. For a quick rundown on what companies are operating in the area and for exactly what is being done in exploration, turn to Page 66. **Natural Gas Search Booms in the Intermountain West**. . Bob Bernick

☐ **Better Health for Executives.** It is the executive paradox that the intense drive which builds a company can destroy the builders. Part of the job of the conscientious executive is to take care of his own

Turn the Page

THIS MONTH . . .

New Readers' Service Cards . . .

In this issue, WORLD OIL's Readers' Service Department introduces a new and easier-to-use mailing card.

- It's in a new location . . . just inside the back cover and facing the Advertisers' Index.
- It's simplified. Now when you want more information on an advertised product, just circle on the card the actual page number of the advertised product as listed in the Advertisers' Index.

For more data on New Equipment or for copies of catalogs and literature reviewed in this issue, you circle on the card the code number of the item as shown in the New Equipment Section, starting on **Page 274** of this issue.

Requests will be transmitted promptly to the advertiser for mailing of the desired data directly to you.

body. On **Page 69** and in layman's language is some sound advice from the medical director of Standard Oil Company (Indiana). **Better Health for Executives** . . . . . **Dr. B. B. Reeve**

☐ **A successful company** is a well managed company. On **Page 72** are some salient problems involved in successful management. It is the author's opinion that management is not necessarily the "top brass." He includes all those who help form policy . . . from supervisors to foremen . . . as having a part in . . . **Management Problems and How They're Solved** . . . . . **Edgar Kraus**

☐ **The hiring interview** is one of the most challenging situations an executive faces. Why do some executives fail to get a clear idea of a job candidate's qualifications? Beginning on **Page 78** are some answers from the author of the much-talked about article, "You're Fired!" **Sizing Up a Job Candidate** . **Auren Uris**

☐ **Petroleum industry expenditures** on new plants and equipment are due to rise in first quarter of 1954 . . . Consumers of gas are being deprived of supplies for future through continuing efforts to make gas producers subject to federal regulation . . . More horsepower on drilling rigs is a recent trend . . . Radical developments are ahead in offshore drilling techniques . . . More accurate well logging forecast. These and other items in . . . **Looking Ahead** . . . . . **Page 63**

☐ **International markets** are not likely to be wrecked by any flood of oil, says Editor Warren L. Baker. He discounts a growing fear that international markets are in for a deluge of surplus oil in 1954. **No Flood of Surplus Oil Ahead** . . . . . **Page 65**

☐ **Surplus gasoline supply** is the only problem still exercising any unfavorable influence on the industry's economic affairs. Other disturbing influences have been corrected during the past few months. See this month's . . . **Report From the Observatory** . . **Page 88**

EXPLORATION ARTICLES

☐ **Southeastern Colorado** is attracting new interest because of commercial quantities of oil and gas being produced from Permian and Pennsylvanian beds in the adjoining areas of Kansas and Oklahoma. This is a significant development for Southeastern Colorado, where no commercial oil and gas have been found although the same reservoir beds exist there. Starting on **Page 101** is a brief geological study of the occurrence and correlation of the Permian and Pennsylvanian rocks of Southeastern Colorado and is designed to help the operator and geologist to better evaluate the possibilities in the area where . . . **Gas Developments Enhance the Prospects** . . . . . **Anthony Gibbon**

☐ **Some valuable suggestions** can be culled from a fundamental type article starting on **Page 106** and dealing with contouring subsurface structural maps. The author emphasizes the need for greater accuracy in presenting a geological and/or geophysical picture. There are ten basic rules which, if followed, will promote more accurate mapping. **Contouring Important in Subsurface Structural Mapping** . . . . . **E. J. Handley**

☐ **A record number of 1035 tests was completed** in January as the year's exploratory drilling campaign got off to a fast start. A year ago 1020 tests were completed in January. The January total also topped the 1017 completed in December. January's efforts paid off with 202 new discoveries and 35 major extensions. See the monthly report on exploratory drilling on **Page 108. Exploration Starts Year at High Level** . . . **Cecil W. Smith**

DRILLING ARTICLES

☐ **A new subsurface recording instrument**—a notable contribution to today's drilling research—has resulted from experimental drilling with a sonic bit. Following WORLD OIL's suggestion, this instrument was run in a 10,000-foot well where for the first time the bit was instrumentized without wires leading from the surface to the recorder. The instrument, which carries its own power supply, measures nine different types of information at once. It will fit any standard sub or drill collar and has application as a research tool or as a logging instrument. See **Page 121. New Downhole Instrument** . . . . . **C. R. Canfield**

THIS MONTH . . .

☐ **It proved something.** When the bit in The Ohio Oil Company's KCL A 72-4 drilled past 20,521 feet last August 20, something more than a new depth record was established. It showed that, given good equipment, a team of men exercising a fine degree of coordination and skill, and all-out assistance from oil industry service companies, feats considered impossible a few years ago now become routine. So writes WORLD OIL's Gilbert M. Wilson of Ohio's world's deepest well in the Paloma field of Kern County, California. With the total depth at 21,482 and a fishing job under way, perhaps now is the time to consider **How The Ohio Oil Company Drilled the World's Deepest Well.** (**Page 128**) ..... **Gilbert M. Wilson**

- Standard equipment is being used..... **Page 130**
- Wire line moved often..... **Page 132**
- Drill pipe used is combination string..... **Page 132**
- Heaviest casing string ..... **Page 134**
- Diamond bits used ..... **Page 136**
- Oil-base type muds used..... **Page 140**
- Fishing jobs ..... **Page 144**
- Geology of the area..... **Page 146**
- The men who did the job..... **Page 148**

A SPECIAL REPORT

PERMANENT-TYPE WELL COMPLETIONS

☐ **Another first in editorial achievement**—for the first time WORLD OIL's entire Production Section has been devoted to one subject. Also, for the first time anywhere the complete details of this new completion method are presented under one cover. **Permanent-Type Well Completions**..... **Page 167**

- **How to prepare the well . . .** takes you through each step in setting up wells for this type completion. The simplest flowing well without a packer to the more complicated gas lift installations are described so that field wells can be actually equipped. Each well type is illustrated by clear diagrams. Engineering drawings of equipment required are shown. This section tells you how. **Page 172.**

- **Working over permanently completed wells . . .** the most complete description of workovers ever published. First, the simple well, a flowing one without a packer, is discussed step by step with procedures indicated by diagrams and photographs. Other type wells . . . a flowing one with a packer, and a gas lift well . . . are verbally worked over. In each case, latest type equipment is described, and shown in cross-sections. **Page 185.**

- **Squeeze cementing data . . .** discusses the latest cementing practices which have proved successful in squeezing permanently completed wells of all types. A modified cement made of regular portland cement, bentonite and calcium ligonsulfonate is used for these relatively low-pressure squeeze jobs. The exact amounts of each material are given in tabular form and listed according to bottom-hole temperature. A quick method of calculating each constituent required is presented. **Page 190.**

- **Abnormal pressure wells . . .** carries the workover of permanently completed wells one step further. Up to now, only normal pressure gradient wells were considered, i.e., a pressure gradient not in excess of that of average salt water. With pressure gradients above that of salt water, workover procedures differ slightly inasmuch as additional precautions are required. However, with the aid of easy-to-follow diagrams, procedures for recompleting abnormal pressure wells are fully described. One of the outstanding features of this new idea lies in the fact that complete pressure control is afforded throughout the entire workover job. **Page 198.**

- **Use of plug cutter . . .** describes a special tool which has proven successful in cutting off cement plugs at predetermined depths in the well. Cement may be spotted by pumping through an extension pipe near bottom, then excess cement reversed out through the plug cutter located higher in the extension pipe. The operation is shown in diagrams. **Page 200.**

- **Dual permanent completions . . .** the latest development to come out of this new technique. How to dually complete a well so that the lower zone could be worked over with wire line methods was the problem. It was solved in a unique manner. This is the first time any information on permanently completing dual flowing wells has been published. Many wells actually have been equipped as described. **Page 203.**

- **How much can you save? . . .** Several case histories show how much has been saved on different type workover jobs. You'll be interested in these. They may not be too unlike your own problems. On one reperforating job, up to 75 percent was cut from the bill. Detail cost statements are shown for comparison with conventional workover methods. **Page 208.**

Turn the Page ➡

UNIVERSITY OF MICHIGAN LIBRARIES

THIS MONTH . . .

PIPE LINE ARTICLES

☐ **Stopping trouble before it starts** is the theme of an article on gas engine blow-by. This engine pitfall results in loss of compression and power. Effective maintenance requires that the engine operator be familiar with conditions which may cause this derangement. For information on how to watch for and test for this condition, see **Page 221, How to Detect and Test for Gas Engine Blow-by**.....**James H. Caldwell**

INTERNATIONAL ARTICLES

☐ **The story of a story.** Would a 23-year-old report of a trip deep into the Russia of 1930 interest WORLD OIL readers? We think so since it's the objective report of an oil reporter who was among the first outsiders to see the Communist monster in its infancy. It's a story that will interest everyone who has wondered what progress (?) Russia has made under the clenched-fist rule of the Communists. This two-part report which begins in the April issue of WORLD OIL is prefaced this month on **Page 239** with a lucid explanation of how it was obtained, by whom, and why it has been withheld for almost a quarter of a century. **The Story We 'Killed' That Men Might Live**.....**Ray L. Dudley**

☐ **Oil in Australia** has created considerable stir throughout world oil circles. The discovery was followed by announcement of three large companies of their plans to extend the search for oil "down under." For a brief summary of latest developments and photographs of operations at the discovery well, see **Oil Has Come Up From Down Under**.....**Page 240**

☐ **Report from the Middle East.** All oil men have a stake in the still growing giant of Middle East oil. Higher flow from producing nations and promises of new sources of oil elsewhere in the Persian Gulf area pose a serious threat to petroleum stability around the world. Turn to **Page 241. Middle East Oil Still Growing**.....**Robert E. Spann**

☐ **Cuba is hunting oil** and a place on the oil map of the world. Kerr-McGee Oil Industries' latest foreign venture involves some interesting features and emphasizes the willingness of the American oil industry to cooperate with other countries in developing natural resources. For a story on how Kermac and a group of Cuban industrialists are pooling their efforts, see **Page 248. Cuban Hopes Center on Wildcat**..**Anthony Gibbon**

☐ **Interest in Peru** has been stepped up since the submarine shelf was opened for private concessions, the first time such action has been taken in South America. The story starting on **Page 251** describes zones opened for bids, rules of operations, and other pertinent information on the country's offshore activities. **Peru Looks Seaward**.....**Dr. J. E. Rassmuss**

NEXT MONTH . . .

THE PANEL. Seated, left to right, Ray C. Lewis, exploration manager, Houston Oil Company of Texas, and past president of the Houston Geological Society; Keith R. Beeman, president of Southwestern Industrial Electronics and noted designer of geophysical equipment; W. A. Thomas, chief geologist, The Ohio Oil Company, Houston; Roy L. Lay, manager, Geophysical department, The Texas Company, and president of Society of Exploration Geophysicists; R. L. Palmer, executive vice president, McCollum Exploration Company; and John Flude, president, Offshore Exploration Group. Standing, Frank V. Stevenson, district geologist, Mining Division, Aluminum Company of America; and Al Reese, managing editor, J. E. Kastrop, production editor, and Warren L. Baker, editorial director, all of WORLD OIL.

They gave us the answers . . .

As a starting point in planning our annual Exploration Issue, WORLD OIL editors had to know what YOU want to know.

We couldn't ask all of you, of course; so we did the next best thing. We asked a panel of experts: If you were editor of WORLD OIL, and had your choice of articles on all exploration topics, WHAT WOULD YOU PUBLISH IN THIS ISSUE?

Here are a few of their answers . . .

- A description of new tools and techniques that reduce expense.
- A discussion of what the company expects of his geophysical contractor—and vice versa.
- Information on where the geophysical contractor's dollar goes.
- An analysis of compensation laws affecting geophysical personnel.

All this—and a lot more—you'll find in your April issue.

WORLD OIL, published every month except semi-monthly in February and August. Entered as THE OIL WEEKLY as second class mail matter December 23, 1916, at postoffice at Houston, Texas, under the act of March 3, 1879.

Looking Ahead . . .

. . . **Petroleum industry expenditures on new plant and equipment** in the first quarter of 1954 will be about 25 percent greater than in the initial quarter of 1953, Department of Commerce estimates indicate. For U. S. industry as a whole an increase of about 5.5 percent is indicated.

. . . **Consumers of gas are being deprived of supplies** for the future through the continuing efforts to make gas producers subject to federal government regulation. Only in recent years have wellhead prices of gas become attractive enough to cause some drilling especially for gas. (Previously, gas was not worth drilling for, and it was found mostly while drilling for oil.) Now the new, faint interest in finding gas is in danger of dying out before causing any substantial drilling, as the threatened result of a discovery would be utility-type regulation of the producing company or operator.

. . . **More horsepower on drilling rigs** is a recent trend due to increased use of jet bits. (Heretofore, H.P. needs were held down as rigs were lightened and unitized to cut costs of tearing down, moving, and rigging up.) Where jet bits are used, pumps need more power, and manufacturers are concentrating attention on pumps of 500 to 850 H.P. While going toward more powerful equipment, the drilling industry also is achieving more effective power from existing equipment. The drilling string is being streamlined to reduce friction in the hydraulic system and deliver more power to the bit itself. Fluid couplings and torque converter drives are reducing rig weight and giving rigs more power per ton of weight.

. . . **Radical developments are ahead in offshore drilling techniques.** A major drilling contracting firm reports it is studying scores of inventions and is not passing up any bets, even if they do look like "Rube Goldberg" nightmares. Within five years diving bells capable of being submerged below water and fully equipped for drilling and with crew quarters, may be a reality. Reports say many ideas now under wraps will revolutionize off-shore drilling.

. . . **More accurate well logging is foreseen** as the result of the successful development of a relatively small cyclotron or "atom-smasher" for use in research work. The machine permits laboratory reproduction of the atomic particles desired for research, including neutrons, beta rays, x-rays, gamma rays, protons or alpha particles. The reaction of these rays on sample formations can be studied as to rate of penetration. The rate of reflection of these formations also can be studied.

. . . **Ultimate world reserves of 1500 billion barrels of crude oil and 500 trillion cubic feet of natural gas** are estimated by Dr. Gustav Egloff. The oil includes 100 billion barrels lying off shore. (So far, about 216 billion barrels of crude reserves have been proved up in the world, including 79 billion heretofore produced and 137 billion yet to be recovered. In the U. S. all reserves so far proved up total 76 billion barrels, including 47 billion already produced and 29 yet to be produced.)

. . . **The oil industry will become more self sufficient** as petrochemicals and other new products derived from petroleum are developed. Industry will provide more of the products used in its operations. An example: the recent completion of a nine-mile plastic pipe line for carrying crude oil from a field in Montana's Williston Basin to a railway loading point. (WORLD OIL, Pipe Line Edition, January, 1954, Pages 208-209.) The pipe was made of a cellulose acetate butyrate plastic. Cost of the line was reported as less than the estimated cost for a steel line.

UNIVERSITY OF MICHIGAN LIBRARIES

GLASS GUN INCREASED PRODUCTION FROM SHOW TO 960 BOPD!

Two previous perforating jobs with conventional jet charges had failed to open flow channels for the oil

Production from a well in a conglomerate formation still remained negligible after two attempts to perforate with conventional jet charges. It was thought that the producing section had been mudded off when the well was drilled in.

In another effort to bring in the well, the operator decided to perforate with the Dowell Glass Gun, using GG-4 charges. Within a few hours after Dowell engineers did the job, the well was producing at the rate of 960 barrels of oil per day!

Drum tests through casing into cement and sand demonstrate the extra value you get in perforating, when you use Dowell Perfojet Service with the Glass Gun. In such tests, Glass Gun charges have shown larger hole sizes and twice the penetration of conventional charges.

Four sizes of charges permit Glass Guns to be tailor-made to fit a wide variety of shooting patterns and hole sizes. Charges can be set to fire in single, double, or triple vertical rows, and at angles up to 30° from horizontal. Because it is self-destroying, there is no danger of hanging the gun in the casing after firing. The well is left junk-free.

Dowell Electric Pilot equipment is used in Glass Gun perforating. These sensitive recording instruments give the engineers fingertip control over the entire operation. Dowell's active safety program is planned to protect both personnel and well equipment. And Dowell research is aimed to give you more profitable perforating jobs.

For more information about how Dowell Glass Guns can help you, contact your nearest Dowell Station. Or, if you prefer, write directly to Dowell Incorporated, Tulsa 1, Oklahoma, Department C-13.

DOWELL SERVICE

Acidizing • Fracturing • Electric Pilot • Perfojet
Paraffin Solvents • Bulk Inhibited Acid • Jelflake®
Corban® • Chemical Cleaning for Heat Exchange Equipment

DOWELL INCORPORATED • TULSA 1, OKLAHOMA
A Subsidiary of The Dow Chemical Company

"First in Oilfield Acidizing . . . Since 1932"

Look to **DOWELL**

FOR OIL INDUSTRY CHEMICAL SERVICE

No Flood of Surplus Oil Ahead

There is a growing fear that international markets are to experience a flood of surplus oil during coming years. Certainly, there will be plenty of oil to satisfy world requirements in the years ahead. However, except for possible temporary periods of over-production, the long range outlook appears to indicate that international markets are not likely to be wrecked by any great flood of oil.

Consumption of oil is sure to continue its spectacular growth, and will be of sufficient size to take care of much additional production.

•

Fear of excess production, to a large extent, is based on the unusually sharp increase in world crude oil producing rates during recent years, and the indication that this upward trend is to continue. World production of crude has nearly doubled since 1945, rising from 7 million barrels daily in 1945 to its current level of 13 million barrels per day.

The concern is intensified because there has been an especially large growth in countries outside the U. S., particularly in the Middle East. The remainder of the world today produces more oil than the U. S., although the latter was producing twice as much in 1945. Whereas U. S. crude production has increased by 2 million barrels daily since 1945, that of the remainder of the world has risen by 4 million barrels per day.

Adding to the concern is the increasing possibility that Iran's production will return to international markets sometime during the next year or so.

It also is recognized that more producing ability than currently needed has been developed in the U. S. However, under conservation measures practiced in the U. S., output will be limited to near required volumes. This is not true in many other countries, hence the feeling that international markets may be flooded by the rapid development of more producing capacity than needed to satisfy markets.

Much more oil will be needed in the future than at present. This may become the industry's salvation.

World consumption of petroleum is increasing rapidly, and much larger quantities surely will be required in coming years.

U. S. domestic consumption of petroleum has risen from less than 5 million barrels per day in 1945 to 7⅔ million barrels daily, and is expected to reach 8 million barrels during 1954. All signs indicate the U. S. will need larger quantities of oil in the future. A conservative estimate would be that U. S. annual consumption will grow by an average of 300,000 barrels daily. This means that in another 5 years, by 1959, the U. S. will be consuming 9½ million barrels per day, 1½ million more than in 1954.

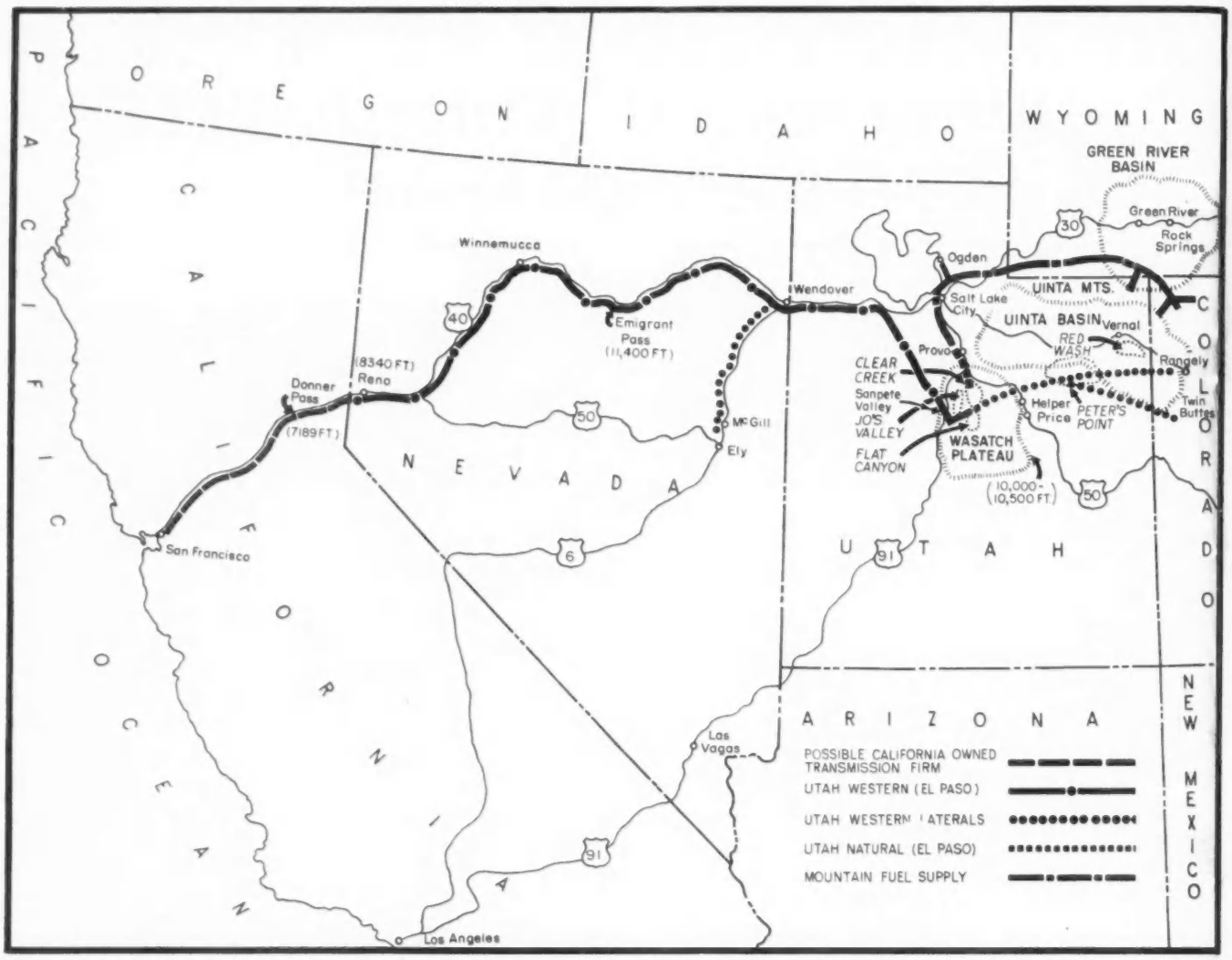
Consuming rates outside the U. S. also are growing by sizable amounts. Consumption outside the U. S. of about 6 million barrels daily in 1954 will be more than double the 2½ million consumed in 1945. Many countries are coming out of their lethargy. Roads and industrial plants are being built. This means increased petroleum consumption. It can be conservatively estimated that daily consumption of petroleum outside the U. S. will rise by about 250,000 barrels per annum. Thus, in another 5 years, consuming rates may be 1¼ million barrels per day higher than today. This would increase foreign consumption to 7¼ million barrels daily by 1959.

When prospective consumption gains in the U. S. and other countries are combined, an increase in world consuming rates of 2¾ million barrels per day is indicated by 1959.

This will require the production of much larger quantities of oil. The gain in consumption may be sufficient to prevent any flood of oil from wrecking international markets.

Warren L. Baker

UNIVERSITY OF MICHIGAN LIBRARIES



Natural Gas Search Booms In Intermountain West

Utah, western Colorado and southwestern Wyoming continue to draw interest while growing in stature as possible sources of natural gas supply for the West Coast.

By BOB BERNICK, Salt Lake City Tribune, Salt Lake City, Utah

WHILE OTHER states of the Rocky Mountains will be centers of appreciable oil exploration during 1954, western portions of the region are experiencing a boom in search for natural gas.

Utah, western Colorado and southwestern Wyoming, while of continued interest to oil companies, are seen in the light of developments during the last two years as natural gas resources bases for fuel supply to the West Coast.

Along that premise, El Paso Natural Gas Company has incorporated Utah Western Pipe Line Company, an affiliate of the Utah Natural Gas Company which also is controlled 66⅔ per cent by El Paso Natural. Utah Western would carry gas to the lines of distributors on the Pacific coast—across western Utah and the deserts and mountain passes of northern Nevada.

The firm currently remains a "dormant" filing with the Utah secretary of state.

Meanwhile, the drive to find sufficient reserves to back transmission approval by state regulatory bodies and the Federal Power Commission is being accelerated.

This increased pace of search and development is shared by Three States

Natural Gas Company, which has committed reserves to the El Paso affiliates; Mountain Fuel Supply Company, which has served as distributor of gas in southwestern Wyoming and northern Utah for many years; Colorado Oil & Gas Company, affiliate of Colorado Interstate Gas Company, and others.

Move fast. Three States, in a series of leap frog extensions, has been proving up reserves of gas at Flat Canyon and Clear Creek as rapidly as possible. One rig is being kept at work drilling development wells at Clear Creek.

A second rig, employed in wildcat stepouts to date, has been moved eight miles *south* to the northern rim of the Flat Canyon Unit. This test, about four miles north of the nearest existing production at Flat Canyon, is known as Flat Canyon Unit 4 and is located on the floor of Huntington canyon.

An edge test, the successful completion of the Unit 4 in either (or both) of the Ferron or Dakota sands, would "automatically give us more than three trillion cubic feet of reserves at Clear Creek and Flat Canyon," says a geologist for Three States.

Meanwhile, Three States is employing one cable tool and one rotary tool test in development work around the Mary Durkin Kearns 1 discovery wildcat at Flat Canyon.

The Mary D. Kearns 2 in 27-16s-6e is the cable tool project. It was initiated with the idea of finding any gas which might exist in the shallower Starpointer and Emery formations. No commercial production has been found in those sections by this wildcat. Cable tool drilling will be carried through the Ferron, however, in hope that increased gas can be developed in that formation.

(Only about one-half million cubic feet a day was found in the Ferron at the Mary Durkin Kearns 1 wildcat, which was drilled with rotary tools utilizing rotary mud. Wells at Clear Creek are drilled through the Ferron, using natural gas as a circulating medium.)

Independents Active. A number of independents, some of them with contracts with these and other firms also are in the activity. The exploration and development program is concentrated in a number of areas, including:

How to Get Free Index of 1953 WORLD OIL

The complete editorial index covering all issues of WORLD OIL published during 1953 has been prepared and is bound separately in convenient pamphlet form. It will be sent free *to all subscribers* who write requesting copies. All you have to do is to refer to the Reader Service blue postcards (on Pages 281-282), fill in your name, company, position and address and add the words: "Send Index." Mail the postage prepaid card and the Index will be sent you.

• The Wasatch Plateau of Carbon, Emery, Sanpete, Utah and parts of Sevier counties, Utah. Here, one of the largest gas fields in the Rocky Mountains is being developed at Clear Creek by Three States, of Dallas, and the Morgan-Walton interests of Salt Lake City, Utah.

• The southern rim of the sprawling Uintah Basin of northeastern Utah and northwestern Colorado, where El Paso Natural Gas Company is particularly active.

• The Greenriver Basin of southwestern Wyoming.

Three States is carrying out a major portion of active drilling on the most prominent features of the Wasatch Plateau. The firm is operator on extensive acreage owned by the Morgan-Walton interests and has received some financial aid from El Paso in development of reserves for Utah Natural Gas Co. and Utah Western Pipe Line Co., commitments.

John A. McGuire, Dallas, president of Three States, says with completion of the Colleen Kearns Steiner 1-A wildcat on the southern portion of the field, Clear Creek now has *one trillion cubic feet* proved natural gas reserves.

He and his geologists see a continuity of natural gas production in the Ferron and Dakota formations between Clear Creek and Flat Canyon structures. Flat Canyon's productive area is now about 12 miles south of the gas found in the Ferron at Clear Creek. The Flat Canyon Field produces from both the Ferron and Dakota, with most of the gas discovered to date emanating from the Dakota.

The Mary Durkin Kearns 3 wildcat, about three quarters of a mile south of the discovery prospect, will employ natural gas in drilling through known productive formations. This well is located in SW 23-16s-6e. It could go to the Morrison formation, below the Dakota, although the decision has not yet been made.

Three States also has a deep test of the northern end of Jo's Valley anticline (west of Clear Creek and Flat Canyon) in process. This wildcat has been shut down because of the weather, but drilling will be resumed as soon as conditions permit.

Jo's Valley structure is larger than either Clear Creek or Flat Canyon. Three States projects another wildcat on the south end of the area in addition to completion of its Colleen Kearns Steiner wildcat on north portion of the anticline.

Perspective. Gas men agree that at least three trillion cubic feet of reserves will be needed to support a line to the Pacific Coast, carrying a minimum of 150 Mmcf daily.

W. T. Nightingale, Salt Lake City, president of Mountain Fuel Supply Company, says the three trillion cubic foot reserve figure for the Carbon-Emery county fields is necessary to supply both Utah demands and pipe line requirements.

He has been substantiated in his view by statements of other pipe liners, although a few express a belief that the Utah Western Pipe Line Co., transmission system could start out with 135 Mmcf. a day.

A year ago, Three States officials were depending on the Colleen Kearns Steiner wildcat at Jo's Valley to give them a new gas field AND the added reserves necessary to fulfill commitments to Utah Western.

However, completion of three wildcat extensions in southern portions of Clear Creek Field—Paul T. Walton 1-X (108 Mmcf.), Helen E. Walton A-3 (110 Mmcf) and Collen Kearns Steiner A-1 (105 Mmcf) — has changed that picture radically.

Successful completion of the Flat Canyon Unit 4 wildcat would, in the opinion of some, give the operating firm sufficient reserves to back petitions of Utah Western for the Utah-California line.

Other Wasatch Plateau prospects. Utah Southern Oil Company, a Salt Lake independent with production at Rangely Field, Colorado, and in

UNIVERSITY OF MICHIGAN LIBRARIES

Wyoming, and Texas, currently is drilling an important Ferron-Dakota test at Orangeville (or West Huntington) in Emery County, Utah.

Southern Production Company is through the Ferron, where oil shows were picked up in its pondtown wildcat, southern Utah County.

Colorado Oil & Gas Co., controls four important prospect blocks on the Wasatch Plateau — holdings which now are the basis of considering farmout dickering. These blocks include Mt. Pleasant, Mesina, Block Mt., and Indianola structures.

El Paso Natural has announced intention of drilling a wildcat on the Plateau in 1954, where that firm has considerable acreage.

On the flanks of the plateau, major companies, such as Carter Oil Co., and Standard Oil Company of California, are buying acreage in the hunt for oil. Socal has taken considerable acreage in oil and gas leases in the Sanpete Valley. Objective is said to be sediments deeper and older than the Ferron-Dakota-Morrison series. But these well-known western gas and oil sands won't be overlooked where present. Carter is active adjacent to Three States' holdings.

Uintah Basin rim. El Paso Natural almost two years ago signed an agreement with Cities Service and Sun Oil companies for a three-well drilling program at Peter's Point, northeastern Carbon County, Utah. That program largely has been fulfilled. And El Paso, after discovery of natural gas in the Upper and Middle Wasatch formations, has scheduled two more wildcats in the area this year.

Drilling Methods. Drilled with rotary tools and using mud as a circulating medium, gas wells at Peter's Point have not proved big producers. However, geologic opinion of El Paso Natural people is that production can be hiked:

- By shooting.
- By "drilling in" with gas or compressed air.

The latter methods were attempted in one wildcat, but water was encountered above the productive zone.

El Paso Natural's exploration program already appears to have proved a goodly acreage. But the big extensions (three miles) appear to have Whether the firm wants or intends to go to Pocatello, Twin Falls or Idaho caused caution about estimate of reserve figures.

At Jack's Canyon north of Peter's Point in Uintah El Paso has scheduled another wildcat after an initial venture proved disappointing earlier in 1953. The firm also has completed a deal with Gulf Oil Corporation for a test of that company's Minnie Maud Block in Uintah County.

El Paso Natural feels there is a vast nosing, containing around 250,000 acres, jutting through Peter's Point into portions of Jack's Canyon, Fire Water Canyon Unit, et al.

Events to date at Peter's Point disclose that diligent drilling might discover large wells. In any event, given proper formation conditions, the two and three million cubic feet a day wells completed under adverse conditions at between 2200 and 2900 feet and 3800 and 4300 feet, are of commercial importance.

It is about 60 miles from Peter's Point to Clear Creek and a lateral line, employing compressors, is not out of the question if reserves at the former field merit.

New Development. Farther east, El Paso Natural has scheduled a development of the Twin Buttes gas field, in which last year it obtained the interests of Frank Buttram, Oklahoma oil figure.

To the north—40 miles southeast of Vernal—is Red Wash field with gas sands above present layers of oil production in the Greenriver formation. To date, Standard of California, which owns the Red Wash unit in its entirety, has not discussed sale of the fuel.

Some of the gas sands have made in excess of 12 Mmcf. a day on drillstem tests. Two wells have been completed as gassers to supply energy for a steam-electric plant, pumping, transmission and fuel for a modern small city which Socal and its operator at the field (The California Company) have constructed.

Between Red Wash and the Rangely area are Rabbit Mt., West Douglas Creek and other gas structures—all showing signs of considerable natural gas reserves, but largely undeveloped.

Southwestern Wyoming is tied into the northern Utah industrial region by transmission facilities of the Mountain Fuel Supply Company. MFS, a distributing, transmission and producing firm, has pioneered the search for natural gas in Wyoming and northwestern Colorado.

First gas field in Utah was completed by this firm at Clay Basin in Dagget County, Utah, years ago. Laterals of the main transmission lines of the company connect with seven old fields (including Clay Basin), in southern Wyoming and northwestern Colorado.

The firm is carrying out an extension field development program at Sugar Loaf, a new discovery in Sweetwater County, Wyoming, and a consistent development program at its main supply anchor at Church Buttes field to the west.

Meanwhile, the Greenriver Basin of Wyoming is experiencing a land-lease play in which El Paso Natural is engaged. A joint test by El Paso and Continental Oil Co. (the operator) is underway in this basin.

Any gas discovered in the Greenriver Basin presumably would move via MFS transmission lines into northern Utah. Depending upon satisfaction of Utah demand, that gas could go on to the West Coast.

Demand. The gas-purchase contract covering Clear Creek, dated November, 1951, provides for 15 cents per 1000 cubic feet for the first five years and an additional cent per 1000 cubic feet each five years succeeding, going to 18 cents at the end of the 20-year period. The proved area of Clear Creek field is 29,000 acres, not including Flat Canyon. MFS has granted its producers the same price in southern Wyoming.

The immediate effect of such contracts is to spur the hunt for natural gas in the Intermountain West for its own sake—and not as a by-product of oil exploration. Even with this field price structure prevailing, $65 worth of natural gas laid down at a residence in Salt Lake City is equivalent to $100 worth of coal and $110 worth of home-heating oil. This price advantage enjoyed by gas is of course, second only to convenience and cleanliness in handling and burning the fuel.

And the industrial demand for natural gas in northern Utah, southern Idaho and Wyoming is significantly a growing one. MFS looks toward extension of its distribution system into Logan, Utah, north of Ogden.

Falls is problematic. There is a lot of "space" between these growing Idaho cities.

Utah, with its copper and lead smelters, steel plants, and growing steam-electrical generating systems, also is on threshold of a chemicals future based on sulfuric acid, phosphate, soda ash, pot ash, coal—and natural gas.

Monsanto Chemical Company and other concerns are actively surveying the state for location of multi-million dollar ammonia plants—aiming at production of ammonia, anhydrous ammonia, nitrates and other nitrogenous compounds of natural gas reduction.

Outlook. Utah, western Colorado, southern Wyoming and Nevada are raw resources states. Their populations have never ceased to climb, even in depression days. They have faced two great needs in connection with industrial development and exploitation of these resources—water and power (or energy).

Great advances have been made in Utah and southern Idaho in solving the water shortage and greater advances are needed during the next half century. Hydro-electric dams, coal, petroleum products, and natural gas in abundance are solving the power requirements.

- Bingham—the open cut mine near Salt Lake City of the Kennecott Copper Corporation furnishes ⅓ of all the domestically produced copper in the United States.

- Geneva—near Provo, is one of the largest steel plants in the world—supplies West Coast affiliates of United States Steel Corp., with plates and pig.

- Rangely—one of the nation's biggest oil producing fields, backs up a growing refining center in the Salt Lake Valley, which in turn supplies products all the way northward into Spokane, Wash.

- Clear Creek, Flat Canyon et al—one of the West's largest potential gas producing areas, from which Utah chemicals industries may sprout and the West Coast be served with fuel.

That is the outlook in the Intermountain West for 1954.—**The End**

Better Health for Executives

By DR. B. B. REEVE,
Medical Director, Standard Oil Company (Indiana)

Part I

Periodic Physical Examinations

YOU executives are the keystone of industry.

You build and protect your organization by perfecting a healthy, sound, efficient administrative structure. Doing this is your special genius.

Often, your drive is so intense that you ignore your own health to achieve your goals.

This is the executive paradox.

Your organization gets healthy—you get sick.

Then, your organization suffers because your body has become unsound.

Part of your job, if you are a responsible executive, is knowing how to take care of your own health—and actually taking care of it.

As an executive, you ask direct questions and expect straight answers. Only you can answer this question: "Is taking care of my health worth the cost?" It's your life, you know. It is also good management.

Here are some specific how-to-do-it suggestions, when you are ready to ask —"How can I best protect my health?"

In order to have facts to go on about the state of your health, it is important that you have periodic physical examinations. Compare them, if you will, with the inventories or the market surveys you'd insist on in your business. How often you take this physical inventory is probably best determined by the advice of your examining physician. My professional opinion is that as an exectuive you should have a physical examination at least once a year—and at any other time you are in doubt about your physical condition.

Your examination should include:

- A complete medical history, kept up-to-date each year.
- A complete physical examination.
- Laboratory tests as extensive as your examining physician professionally advises.
- A complete review of the findings with you by your physician. Have confidence in your physician.

As the years tick off, your exact medical history grows in fundamental importance. It is only wise to be fair with your examiner—and yourself—by being honest about your past and present ailments, by giving your examiner complete information. Because your state of mind can seriously affect your health, describe to your examiner not only any symptoms you are having, but also discuss with him your habits—and how you react mentally and emotionally to your problems.

After the examination has been completed and reviewed with you, you should follow your doctor's advice, of course. On the basis of the examination, he will tell you how you can correct minor or major difficulties—or instruct you about how you can live longer with conditions that cannot be corrected.

You'll find that regular physical examinations will relieve you of doubts about your ability to carry the load expected of you as an executive. And if it's found, somewhere along the years, that your health is in jeopardy, you may want to do some serious thinking before accepting the increased responsibilities of further advancement. Your executive decision will have to be what is fair to your company—and fair to yourself.

You will feel sure, if you have regular periodic physical examinations and follow the advice given you by your physician, that you have done what you can toward making both your company and your health secure.

(To be continued)

UNIVERSITY OF MICHIGAN LIBRARIES

Saved $1,000.00

on prime mover for pumping unit

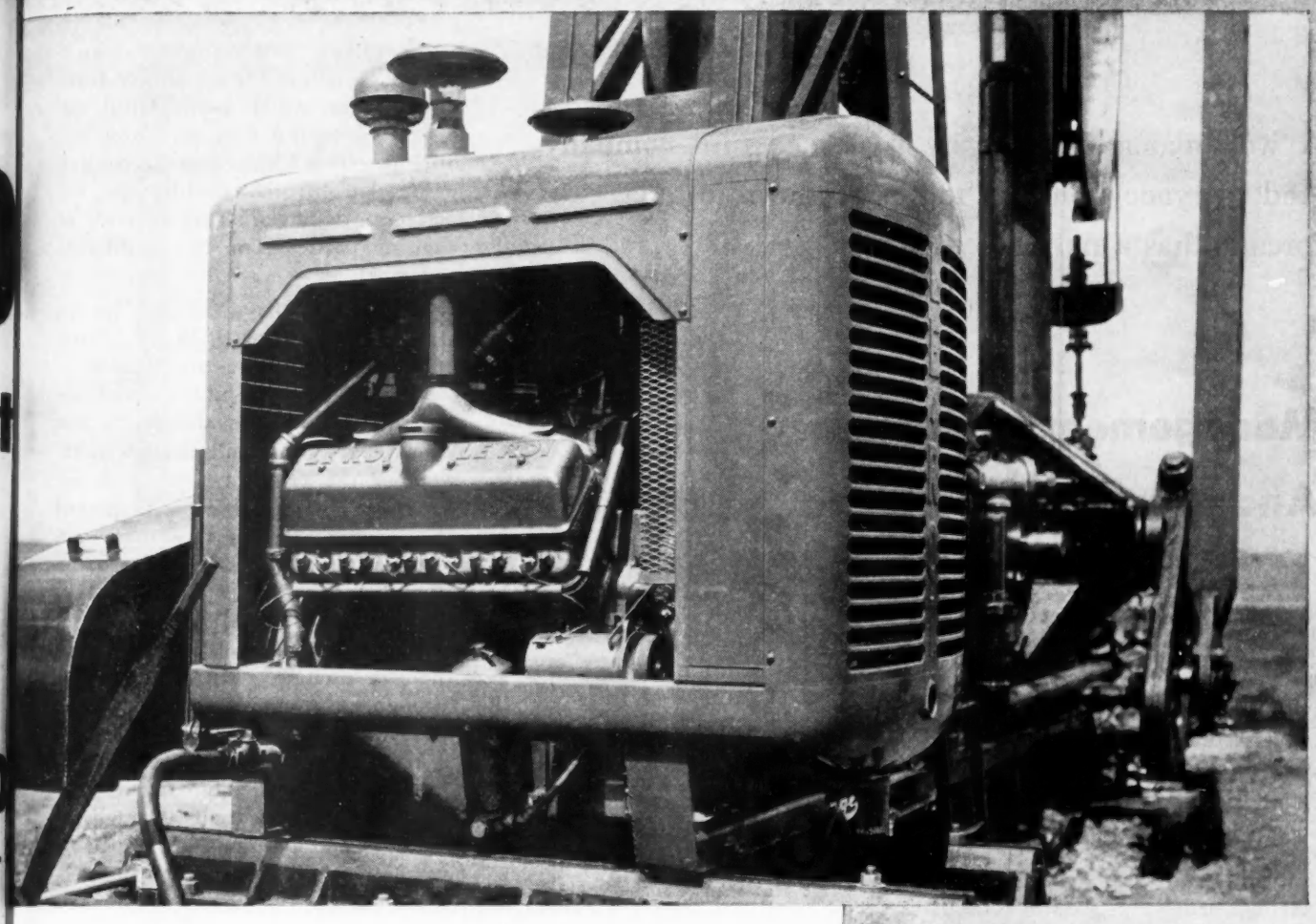
. . . and now enjoys small-engine operating economies

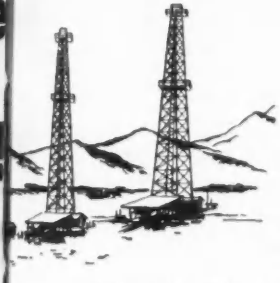
Uses Le Roi H540

(540 CU. IN.

. . . instead of 800-cu. in. engine

—yet does same job!





IF you're cost-conscious (and you really have to be today), you'll be interested in this experience at an Anderson-Prichard Oil Co. installation.

They installed a Parkersburg Air-Balanced Pumper on an 8,000-foot well, to pump about 100 barrels of liquid per day. This Parkersburg is a 460,000-inch pound-unit with about a 19,000-lb. rod load and 120-inch stroke.

Usually, these units are set with an 800-cubic inch engine. However, Anderson-Prichard powers their pumper with a Le Roi H540, a 540-cubic inch engine, which handles the load easily.

By doing this, they made an initial saving of around $1,000.00. And — they put themselves in a position to enjoy the operating economies of a smaller engine.

Because Le Roi's keep expenses to a minimum — because Le Roi's have the versatility for all oil-field service — Le Roi installations are being made in an ever increasing number, for pumping, drilling, workover, gathering, pipeline pumping, power generation.

No matter what your engine application, it pays you to find out about Le Roi oil-field power from your Le Roi distributor or supply house. Ask them to show you some Le Roi installations.

LE ROI

LE ROI COMPANY

A Subsidiary of Westinghouse Air Brake Co.

MILWAUKEE 14, WISCONSIN

Plants: Milwaukee • Cleveland • Greenwich, Ohio

Oil Field Headquarters: Tulsa, Oklahoma

SERVICE

as near as your telephone

Complete parts stocks
Skilled mechanics on 24-hour call
Unexcelled overhaul facilities

Oilfield Sales-Service Network

Oklahoma
Le Roi Company Branch—Tulsa
Carson Machine & Supply Co.—Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company—Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, New Orleans, Louisiana

North & West Texas, New Mexico
General Machine & Supply Co.—Odessa, Snyder, Texas
Nortex Engine & Equipment Co.—Wichita Falls, Texas

Kansas
Carson Machine and Supply Co.—Great Bend

Michigan
Hafer Engine Service—Reed City

Rocky Mountain Area
Gehring Equipment Co.—Casper, Wyoming, Rangeley, Col.

Mississippi, Arkansas and Northern Louisiana
Ingersoll Corporation—Shreveport, Louisiana, El Dorado, Arkansas, and Jackson, Clarksdale, Mississippi

West Coast
Le Roi Engine Sales Co.—Long Beach, California

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford

Canada
Lucey Export Ltd.—Calgary, Edmonton, Alberta

UNIVERSITY OF MICHIGAN LIBRARIES

A well managed company is a successful company. And everyone from the 'top brass' down to the foreman has a part in . . .

Management Problems And How They're Solved

By EDGAR KRAUS, The Atlantic Refining Company, Dallas

WHAT IS MANAGEMENT? Before discussing management problems in the oil industry, and especially those involved in exploration and production which will be stressed in this article, it might be well to define the term "management."

Management usually is defined as a group of individuals within a corporation charged with the responsibility and authority for forming and carrying out policies. Actually, it isn't too clear in most corporations just what is included in the term management. "Top" management, "middle" management (junior executives), and "first line" supervisors are some of the terms used in subdividing this larger group. All are under the umbrella of "management" and illustrate the need for further refinement of the inclusive designation.

A popular view, is that all who help formulate policy by recommendations or through committee functioning, constitute a part of management. This includes all supervisors down to foremen and means that technical personnel in most organizations become part of management early in their careers.

Organizations must function through the delegation of authority and of "specialized functions." Technical groups are on the end receiving the delegation and, in turn, must understand the need for delegation. That is a problem which involves training quite unlike that which results in efficient and technically sound engineers and geologists.

It might be styled Development and Training of Managers.

To train, we must have some idea of what the finished product should be. In the petroleum industry, executives or managers ideally should have familiarity with and varying degrees of working knowledge of:

- Exploration methods: Geology and Geophysics
- Operation methods: Drilling; Production; Civil; Mechanical and Petroleum Engineering; Chemistry, Purchasing; Accounting
- Finance: Evaluation techniques and the science of probabilities
- Law
- Sociology

The last mentioned is by no means the least important; actually, the importance of human relations is often forgotten under the pressure of operating problems, meeting competition, and making a profit.

In addition, managers must have initiative, be honest, have vision and courage, and feel responsibility to the community. They must have the quality of perserverance, too.

It is obvious that this ideal combination of prerequisites is not easily found or developed by short training. It gives us an insight into the reason for the growth of the committee form of operation which permits full use of specialists. But that only adds another problem. Managers need then to develop effective techniques for perfecting teamwork and methods of securing participation of subordinate personnel.

The industry has used such means as offered by Harvard, M.I.T., Pittsburgh, Northwestern, and others in the training of executives. Whether the results can be evaluated, is not known. It is difficult to determine whether the training course is responsible for successful development of executives or the fact that men with outstanding qualifications, background and character are chosen to take the course. Certainly, the formal campus training can do no harm. Industry itself is training managers through the committee system which, though cumbersome, is educational: by participation in management conferences; and, by systematic progression as working assistants through organization in positions of increasing responsibility. Such programs of executive development should be formalized and systematized and carried through on definite schedules.

Having trained managers and executives, corporations are giving increased attention to the problems of keeping them. Under the current tax structure, it is difficult to adequately reward salaried executives in the higher tax brackets by increased compensation. Articles in Fortune and Harvard Business Review in recent months have dealt with that problem of executive incentives. Stock purchase option arrangements, profit sharing plans, and other benefits are being offered by corporations to assure comfort, happiness and prestige to executives. That problem is far from solved, but stockholders, boards of directors and officers of corporations are giving it continuing study.

This problem of executive incentives has another corollary. Technical employes with 5 to 10 years service with corporations are finding what appears to them to be greener pastures elsewhere; sometimes with independents, or in business for themselves and frequently outside the industry. If there were a clearer picture of what they might expect in management posts and the possible financial re-

Mr. "M" was the picture of health

Mr. M. was in the best of health, and when we first suggested that he take certain steps in case of death he thought it was a lot of needless trouble. We showed him how our Trust Department could arrange his affairs in an orderly way, and allow his operation to continue after his death.

Following the advice of our Trust Department, he had his lawyer draw up a will for him. And, even though he thought it was a waste of time, he had his wife's will made, too. His finances were set up to run as smoothly and as efficiently as his oil operation. Every future possibility had been taken care of in the plans made by the Trust Department.

Now this story has a twist. Mr. M hasn't died yet. But he lives in Texas, and his wife died early in the year. Had she died without a will, and if her community property share of his operations had not been taken care of by such will, he would have had a sizable part of his estate tied up in court proceedings for many months. He would have missed out on an excellent deal which he was able to make. And now he knows that when he does die his children will benefit, through this orderly financial arrangement, from the energy and hard work he put into building his holdings.

The National Bank of Commerce is geared to help you with your problems. Impartial advice, based on our experience as oil men and money men will help you, too. Oil men **going up** come to the Oil Loan Department of The National Bank of Commerce.

E. O. BUCK, VICE PRESIDENT, OIL LOAN DEPARTMENT

THE NATIONAL BANK OF COMMERCE

OF HOUSTON

Gulf Building, Houston, Texas "The Bank for All the People"

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Facilities of the Oil Loan Department of The National Bank of Commerce are available in Wyoming, Colorado, Nebraska, New Mexico, Texas, Louisiana, and Mississippi.

UNIVERSITY OF MICHIGAN LIBRARIES

wards, they would very possibly continue in corporation work.

Technical groups have been much involved in the form of the organization which enables the corporation to function. Centralized versus decentralized—line versus staff—horizontal versus vertical—all have been or are being discussed. The problem lies in the necessity of maintaining important human relations, of obtaining more face-to-face contacts, and of releasing top management from operations pressure and at the same time not losing the great benefits of the corporation. Notwithstanding the demagogue's critcism of the large corporation, it does have some very real advantages. To mention only a few: centralized purchasing; best use of personnel by centralized hiring, shifting, promoting, throughout the company; best use of an aggregation of accumulated experience and know-how; and, a training program that is not limited to small areas geographically or technically.

How can the great advantages of the corporation be saved and still accomplish those needed delegations inherent in decentralization? Experts on organization state that it can be done through a system of controls. To the technical man, that usually means supervision from one side and control from another. Working for several bosses should not disturb him; it is in fact good training, for managers also work for stockholders and owners and public and government. The trend today is towards decentralization. This means an increased need for managers, and technical men will be called upon to fill those posts along with those whose background may be law or finance.

An almost daily recurring problem which besets operating management and technical groups is to reach a compromise on the expenditures warranted to obtain complete information. The technician and scientist naturally desire all the valid and accurate data possible to obtain. There is a practical limit to the amount of money that can be expended in that quest, profit still being a prerequisite. For example, in the drilling of an exploratory or extension well, the geologist and reservoir engineer want complete data from the grass roots to basement rock to enable complete and accurate subsurface studies, complete reservoir analysis and complete evaluation of each prospective pay horizon to be made. That is desirable and laudable, except that it may cost too much. Every operator nowadays has the fear of drilling through an oil or gas field and hopes to avoid such a devastating mistake. But, how much can he afford to spend as insurance on duplicating safeguards, cores, tests, logs, services? Daily compromises follow discussions on this ever present dilemma. Certainly expenditures for obtaining information which will not be used for 20 to 30 years are subject to question. Sands in multiple-pay pools are frequently carefully evaluated by expensive tests, although it is known that they will be "behind the pipe" for a long time. Deferment operates as badly in that case as in estimating present worth of oil to be produced in 30 years.

This matter of over-geologizing, over-engineering, over-gadgeteering, duplicating services, etc., was stressed some three years ago by Reese Taylor, president of Union Oil of California, in an article entitled "Banausia[1]." This facetious and slightly exaggerated history of the steps leading to the drilling of a wildcat well depicted the dangers of over-specialization and loss of perspective. Less than a year later, Walstrom,[2] at the API, illustrated the engineering viewpoint by a thoughtful paper outlining a comprehensive program for wildcat wells which was designed to safely yield the maximum information and correctly evaluate each possible reservoir. Somewhere in between these extremes must lie the solution, a compromise at best, which permits each technical aspect to be viewed as it relates to the final objectives.

The problem of the proper distribution of capital, manpower and effort between frontier areas with promise and proven (close-in) provinces is one requiring advice from technical men. In exploration, that question usually devolves itself into how much exploratory effort, lease expenditure and wildcatting should be assigned to remote areas not yet oil productive, where subsurface information is at a minimum. The financial returns from a program such as this will certainly be deferred, the hazards are great and from a narrow, short-sighted viewpoint it certainly does not appear that any large proportion of the industry's efforts and money should be so expended.

But, the close-in plays and developments within the presently productive outlines of our petroliferous provinces cannot long continue to replace the vast amounts of oil being consumed. The demand will continue, and the need of exploring and then exploiting new regions is therefore unquestionable. What proportion of the industry's—of each company's efforts and expenditure should be so used? Geologists, geophysicists, drilling engineers, evaluation engineers, in addition to financial and political specialists, will be consulted and required to help answer the question.

Pipe lines have similar expansion worries. When can they afford to extend lines to take care of new production? How much of their capital should be expended in building lines not justified by volumes presently available, but which may be filled in "X" years to come? In marketing, how much hard-earned money can be put into bulk stations and service stations where the population is thin, in the hope of building up good will to the time when the area develops and demand increases?

The industry is expending vast amounts yearly in research. Technical

About the Author

EDGAR KRAUS has been with The Atlantic Refining Company since 1921. He now is manager of the Exploration Division of the domestic crude oil production organization with headquarters at Dallas. Prior to joining Atlantic, he was with Pierce Oil Company and was active in petroleum engineering and geology as a consultant. He entered the oil industry in 1919. Kraus was born in New York, N. Y., and was graduated from Columbia University School of Mines with an E. M. degree in 1917.

and scientific groups are greatly concerned and constantly involved in decisions on the kinds of research which should be prosecuted and in the proportion of the company's expenditure which should go into research. After research, there is the problem of applying the findings and developing to routine use the techniques growing out of the research. All such problems are challenging and are being ably met by technical men.

Management is exceedingly conscious of the problems which arise because of the public's lack of understanding of the oil industry, its methods, its organization, and its aims. Good public relations are more than organized publicity drives, more than advertising campaigns, and more than legislative advisory committees. Each individual who works in the oil industry represents it, to the public. Technical men have so much contact with the general public that they have a special responsibility in this respect.

Public hearings of all sorts, contacts in the field and in the office give opportunities to develop good public relations. In a more restricted view, the technical employes also represent the companies for which they work. Their participation at hearings, technical meetings and public gatherings gives them excellent opportunities to reflect the tone of their company and to improve its relations with the general public, its competitors, regulatory and governmental bodies.

Problems are manifold. Solutions will depend on the branch of the industry involved, the size of the corporation, and on forces outside the industry, but primarily on people and business personalities. Given a climate of free enterprise, continued confidence of the public and reasonable luck, the petroleum industry will find satisfactory solutions to its problems. Let the technical man be intellectually honest, broad in his viewpoint, and let him be an integral part of management and really feel that he is, and he will contribute mightily to the solutions.

REFERENCES

[1] "The Greeks Had a Word for It—Banausia," WORLD OIL, April, 1949.

[2] J. E. Walstrom, Standard Oil Co. of California, San Francisco, Calif.

ACKNOWLEDGMENT

Prepared for WORLD OIL from a paper presented at a recent Petroleum Engineering-Management Conference, University of Oklahoma, and sponsored by the University of Oklahoma School of Petroleum Engineering, College of Engineering and Extension Division.

—The End.

The Courts Say . . .

in recent insurance cases

Shelton

This column is to inform—not advise. It presents the current trend in legal thinking on insurance cases. The law varies from state to state and its application depends upon the facts of the particular case. Do not attempt to apply it without consulting your attorney.

By JOSEPH M. SHELTON, Attorney at Law, Dallas

That trip for a "Hot Breakfast" was in course of employment

EMPLOYE was a nightwatchman. On weekends he was required to be at employer's plant on continuous uninterrupted duty from Saturday noon until 7:30 a.m. Monday. He was allowed to go home Sunday morning for a hot breakfast and to pick up his lunch. It was understood he was on "company time" while on this trip home. On a Sunday morning, on his way home, he was killed by a train about 400 yards from the plant. The insurance company appealed from the jury's award of death benefits.

The U. S. Court of Appeals said in affirming the judgment that the danger encountered by employe was peculiar to the long period of uninterrupted employment and the necessity of the trip home for nourishment. The allowance of the trip home for a hot meal doubtless contributed to efficiency in his duties for the employer. The condition was an inducement to employe to take the job and an important part of the employment contract. He was in the course of his employment when injured.

—New York Casualty Co. v. Wetherell
193 F. 2d 881 (U.S.C.A., 5th Circuit, 1952)

That worker was a "Texas Employe."

ROUGHNECK WORKED by the day in Texas for a drilling contractor. Crew was "bumped" and contractor said roughneck could be employed later on another well to be started in Texas. He worked for three other employers before contractor called him to work in New Mexico. He was injured within a year after leaving Texas. Roughneck sought compensation under the extra-territorial provision of the Texas Act.

The Texas court indicated that where employment is interrupted under an understanding of further employment of the same general character, the status of a "Texas Employe" for compensation purposes is preserved if the employe returns to work within a reasonable time even though in another state.

—Hale v. Texas Employers Ins. Ass'n.,
239 SW 2d 608 (Tex. Sup. Ct., 1951)

That it was an injury to fingers and not the hand.

ROUGHNECK caught right hand between two drill collars resulting in a partial amputation of the second and third fingers. There was no other injury to the hand as a whole. The employee urged that the loss of the parts of fingers affected the efficiency of the entire hand and he should be compensated accordingly. The insurance carrier took the position that the injury was confined to the fingers and compensation was only due for them.

The Supreme Court of Texas said if there was an impairment to the use of the hand, other than that merely resulting to it from the loss of the fingers, there would be liability supporting recovery in proportion to such impairment of the use of the hand; but, if the evidence shows the hand was not impaired except as it was affected by the loss of the fingers, there would be no recovery on the whole hand.

—Texas Employers' Ins. Ass'n. v. Brownlee
256 SW 2d 76 (Tex. Sup. Ct., 1953)

UNIVERSITY OF MICHIGAN LIBRARIES

Sizing Up A Job Candidate

By **AUREN URIS,** Research Institute of America, New York

EXECUTIVE A, after 15 minutes of talk, has a clear picture both of the personality and abilities of the job applicant he is interviewing.

Executive B, after an hour of talk, feels he's getting nowhere. He later confides to a colleague, "It was like pulling teeth trying to get sensible answers out of the man."

And the man's reaction? "He (executive B) gave me a rough time. I know I made a terrible impression, but his tactics didn't help matters any."

How Do You Measure Up?

The hiring interview is one of the most challenging situations an executive faces. Frequently, it's a measure of the interviewer as well as the interviewee.

Most executives instinctively follow most of the rules of sound interviewing. The trouble is, omission of a single one of them may lead to an unsatisfactory result. Here are the highlights of a successful interviewing method. How well do your own practices match up?

1. Are you aware of the interviewer-interviewee relationship?

It's important to understand the attitude of the man across the desk. In the average case, the job interview represents a major test. A great deal of hope and expectation may hang in the balance. You should expect him to be tense, for example. Also to be expected is the probability that he'll react differently in the interview than he would ordinarily, unless certain positive steps are taken.

And don't mistake your own role. Clearly, you're in the driver's seat. All the more need, for you, therefore, to treat the applicant with consideration. The initiative, of course, rests with you. What happens, or doesn't happen —during the interview—results from what you do.

2. Do you know how to put him at ease?

"Smile, be friendly, put the interviewee at ease." These are generally accepted principles for opening an interview. They aim to relax the person you are talking to. Trouble is, they are not easily achieved.

The difficulty is that in most instances the job applicant's tenseness is likely to be deep-seated. To really do the job right, therefore, you may have to work at relaxing him during the entire interview. It can be done if you think in terms of a two-level interview:

. . . **Defrosting.** This part of the activity—your manner, what you say, what you do—aims at putting him at ease.

You have a better chance of success by—

(a) **making it low pressure.** In the defrosting period, stay away from critical or touchy matters.

(b) **asking routine questions.** It may even be desirable to spend a few minutes on unrelated or trivial matters. Pose only those questions which can be answered without hesitation, involving no strain or possibility of upset.

You can usually tell when your defrosting is successful. In one man's case, you'll know he's relaxed because he draws lightly on his cigarette. In another case, you can tell by his expression—the quality of his smile, for example. When signs of tension disappear, you are ready for—

. . . **Brass tacks.** Now you can go ahead and ask questions that directly concern your objectives.

Just keep in mind that tensions sometimes recur. You may put the applicant at ease, and then possibly because a question has hit a sensitive area, he's no longer relaxed. In this case, switch back to the defrosting level momentarily.

3. What kind of pattern should your interview follow?

The nature of the information you get is influenced by your choice between (a) a directed interview or (b) a flexible interview:

The directed interview. You keep a pretty tight grip on the reins, guide your talk along the lines you've set in advance.

The flexible interview. Sometimes called the nondirective interview, this method is more or less self-generating. The question you ask at any given time stems from the answer or reaction to a previous question. The line of your questioning must be flexible to permit you to follow up all the possible angles.

Here's a comparison of the two methods:

Directed Interview	Flexible Interview
Application	
Best for investigations with well-defined goals and clear-cut lines of questioning. Examples: jobs with simple qualifications—secretarial, for instance.	Especially suitable for measuring an applicant for a difficult job, in which personality, for example, may be a critical factor.
Preparation	
Can be mapped out in advance, and in complete detail.	You can only decide on your general objectives, have to tailor the interview as you talk.
Time Limit	
The length of the interview is almost entirely in your hands.	You can't be too sure how long you'll have to stay with it to do a thorough job.
Results	
Likely to give you what you're after for routine purposes: personnel record data, work experience, etc.	Best method for giving an applicant a chance to open up. It's an ideal digging tool.

4. Do you make the best possible contact?

Occasionally, an interviewer finds himself up against a problem even tougher than silence—that's over-politeness.

No matter what you're talking about, the job applicant agrees, and answers in the mildest and most non-committal terms.

Politeness, in this case, is a coverup. Beneath it you often find fear, nervousness, the resolve "not to stick my neck out."

To break through the armor of politeness, you must first make sure that you yourself have not set the example. Informality, frankness and friendliness on your part are the only real cures. You convey your interest in the interviewee as a person by the things you say. During the course of the interview you have an opportunity to show—

Agreement. Where you can do honestly, go along with the views that the interviewee expresses. "I often feel that way myself." Your willingness to share his feelings and attitudes makes for a better contact.

Encouragement. A hesitant or shy interviewee can often be given increased self-confidence by such phrases as: "I see"; "That's very clear"; "Go on."

Understanding. Finding that he's face-to-face with someone that really understands him can break down many obstacles to good contact. Try: "I get what you mean"; "Your reasons are understandable."

5. Should you use tricks?

Some executives report favorably on an interviewing stunt which they say, gets them information they could not otherwise get. One man, for example, speaks highly of his success in uses the "Stress" technique. To see how an applicant will react, for example, he may start an argument, noting whether the applicant will fight back, cave in, etc. etc.

Interviewing devices of this kind may or may not be desirable, depending (a) how you use them; (b) what you are after. Keep in mind, for example, that the interview situation may be totally unlike any job situation in which the applicant later finds himself. Many a high powered, aggressive executive, for example, may be able to think back to *his own* hiring interview in which he was as nervous as the average.

An important point to keep in mind, of course, is that you may have to work with the man you hire. Any unfavorable advantage you may have taken in the course of your interview may lower your rating in the mind of the interviewee.

6. Do you know the best way to end the interview?

Talk that just peters out is likely to leave the interviewee with a "so-what" feeling. The interview must have a definite windup. Cover these points as you close.

. . . Sum up: "We seem to have covered all the necessary points in our talk, Mr. Smith."

. . . If you have no unanswered questions, make sure the same is true of him. Give him a final chance to clear up any doubts he may have.

. . . Keep the way open for a return engagement. If there are still unexplored areas to be covered, or any issues which have been raised which require further attention, let him know these won't be neglected.

. . . Tell him you'll keep him informed of any new developments which affect him.

. . . Thank him for his cooperation.

Finally, keep in mind that in many companies and in many communities, the interviewing of job applicants is an activity affecting not only your hiring but also your relations with the public. Fairness, pleasantness and courtesy have never done any known harm, either to a company's or an executive's reputation.

The Big Moment . . .

for MAJOR B. A. HARDEY

BURTON A. HARDEY would have been an attorney had the University of Texas permitted his enrollment in its law school at the tender age of 17.

"Too young," ruled school officials.

So Burton changed his course of study. And it was almost a quarter of a century later before he gave up the idea of becoming a lawyer. But that abrupt change in plans resulting from the school's decision was not his Big Moment.

That came in 1932, along with the East Texas oil field, when he was managing Republic Gas Corporation, which he founded. Resigning that position he reached a quiet, steadfast decision to become an independent oil man.

B. A. Hardey

He felt that in that capacity he would have a greater chance to put to work his earnest philosophy that one who benefits from an industry should put part of himself back into that industry.

And the Major has done exactly that—with a contrary-to-doctor's-orders vigor that brings wonder to the eyes of friends. He has drawn freely from his vast store of energy and experience and resourcefulness to serve his city, state, nation and industry in a host of positions.

UNIVERSITY OF MICHIGAN LIBRARIES

It's Up to the Industry to Solve the Existing Executive 'Shortage'

The oil and gas industries, along with U. S. industry in general, are having difficulties in finding enough well-rounded people to fill management positions. And they are quite likely to continue to have this trouble, as these industries doubtless will keep on growing and expanding, while there is no promise of any early easing of the shortage of people qualified to serve as executives.

It is essential for oil and gas companies to take positive action toward solving this problem. They can do two effective things toward providing themselves with needed executives and managers.

1. They can develop more future executives from within their own ranks.

2. They can take an active part in promoting broader and better rounded education of people at high school and university levels, so that there will be more emphasis on scholarship and all-round ability and less on specialization.

Oil and gas companies must actively and systematically develop executives. Action required includes management training programs and other means of making the most of the talents of employes. Management must make the best possible use of its manpower by making it easier for a man to broaden his experience and become qualified for executive positions. To the extent that they have failed to provide employes the opportunity to broaden their knowledge and experience in the business, companies have themselves been partly responsible for scarcity of qualified executive personnel. Correction of this fault will help solve the problem.

Among men coming into industry in recent decades, there has been increasing specialization and decreasing scholarship. Colleges and universities have been training people too much as specialists because in that way the graduates could be of greater immediate value to their employers, though of less potential for executive jobs in the future. In high schools, too, education has not been sufficiently broadening, some business surveys have indicated, and should be made to teach students to think more clearly, give them broader training in sciences, mathematics, language, and liberal arts, and emphasize the need for constant self-improvement. If oil and gas companies will actively and financially encourage this broader education generally, they will ultimately have relatively more employes suitable for development as executives.

Oil Still Has a Selling Job to Do

"People in the Southwest are twice as favorably disposed toward oil as are those who live anywhere else."

This is one of the most striking conclusions of a nation-wide survey recently made by Opinion Research Corporation under the auspices of the Oil Industry Information Committee of The American Petroleum Institute.

Here is another in an endless list of reminders that those who understand us like us best. Because of the heavy concentration of oil activity in the Southwest, people in this region understand the industry. Hence, they look favorably upon it.

Conversely, those who know us least are more prone to be suspicious of us. They are the people who originate and perpetuate the unpleasant beliefs discovered in the survey. Beliefs like these:

- Forty percent of the U. S. population say they have heard that oil companies buy up and suppress gasoline-saving devices. Nearly two-thirds of these people seem inclined to believe the rumors.

- A higher percentage of people than in the 1950 survey hold the opinion that a few large companies control the industry.

- Twelve percent more people than in the previous survey think the price of gasoline is high in comparison with other commodities, and a significant upward trend in this respect is apparent. Twenty-seven percent think the profit level is too high.

This is not to say that the over-all findings of the survey were unfavorable. Far from it. Most people think well of us. But not enough. There is still a job to be done in selling the oil industry to America.

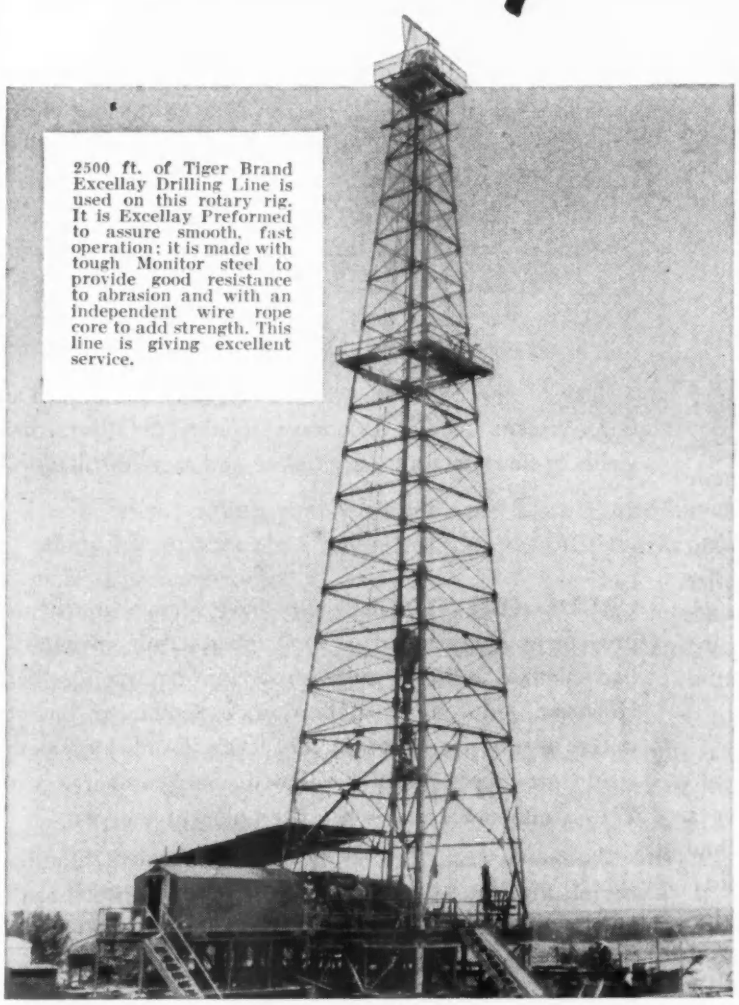
Rig Market Good

A good market in the drilling rig manufacturing industry was forecast by oil executives and contractors attending a recent meeting of the Tulsa Chapter of the American Association of Oilwell Drilling Contractors in Tulsa.

At the same time the oil men expressed a belief that a possible shift in drilling concentration will be made shortly from the Mid-Continent region towards the Gulf Coast and Permian Basin of West Texas.

Basis for the prediction for increased sales of new drilling rigs was the fact that the drilling industry is due to replace and modernize many rigs which have been operating at a high rate during the past two and one-half years. Furthermore, the improved market for new rigs was also predicated on impending deeper drilling in the Gulf Coast area, where first-class equipment is imperative.

Oklahoma driller chooses Tiger Brand *Excellay* Wire Line



2500 ft. of Tiger Brand Excellay Drilling Line is used on this rotary rig. It is Excellay Preformed to assure smooth, fast operation; it is made with tough Monitor steel to provide good resistance to abrasion and with an independent wire rope core to add strength. This line is giving excellent service.

THIS rotary rig, owned by Beacon Drilling Co. of Tulsa, is working at about 8,000 ft. in the Panther Creek Field near Paul's Valley, Oklahoma. In order to be sure of getting a long-lasting drilling line that would keep line costs low, Beacon used a 1⅛" Tiger Brand *Excellay* Preformed Rotary Drilling Line with independent wire rope core.

Excellay preforming preshapes the strands to the helix they will be required to assume in the finished rope. As a result, Tiger Brand *Excellay* Line withstands bending much better than an ordinary wire rope. It has greater fatigue resistance and gives more ton miles of service before it must be replaced.

What's more, Tiger Brand Excellay Line is less likely to kink or twist than a non-preformed line; it is less lively; it can be spooled faster.

If you want these advantages in *your* drilling lines, specify Tiger Brand *Excellay*. This type of line also gives superior performance in coring lines, casing lines, winch lines, and rod and tubing lines. Your American Wire Line Distributor has complete information.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL

UNIVERSITY OF MICHIGAN LIBRARIES

By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

Gasoline Is Only Economic Problem

SURPLUS GASOLINE supply is the only problem still exercising any important unfavorable influence on the industry's economic affairs. Other disturbing influences have been corrected during the past few months. All over-supplies of distillate fuel oil have been wiped out by cold weather during the first six weeks of 1954. Crude oil inventories have continued to decrease, and now are in very good position.

The industry has an excellent opportunity to do much to help the gasoline situation by holding crude runs to stills to reasonable levels during the next several months. Lower crude runs, especially if accompanied by downward adjustment of gasoline yields, would do much to improve the gasoline stock situation. If this can be accomplished, the oil outlook would improve greatly.

On the other hand, high refinery runs during March would add more to gasoline inventories and further endanger the outlook. This would make stocks unbearable by the end of March. Lower gasoline prices already have developed in some areas. Any substantial further additions to inventories threaten to bring widespread price cuts. This would jeopardize crude oil prices, although producers have succeeded in doing a good job of keeping supply in line with demand during the past several months.

•

GASOLINE STOCKS in mid-February stood at an all-time high of 176 million barrels, 21¼ million above a year ago. However, at the beginning of the year they had been 23 million barrels greater than the previous year. Furthermore, a sizable portion of the increase has occurred in California. Stocks of gasoline east of California were 15 million barrels higher than a year ago on February 13, although they had been 18 million greater at the beginning of the year. California gasoline stocks in mid-February were more than 6 million barrels above a year ago, and thus accounted for nearly 30 percent of the nation's gain.

The industry's surplus supply of gasoline has been created by excessive crude runs to refinery stills. Refiners have continued to maintain high refinery runs although it has been evident for at least six months that too much gasoline was being manufactured.

DISTILLATE FUEL STOCKS now are in fine shape, although there was some worry about excessive supplies until recently. At the beginning of the year inventories of distillate fuel were 16 million barrels greater than the year before. However, cold weather during January and early February has cured this problem.

As a result of cold weather in the Midwest and North Atlantic regions, fuel oil stocks have decreased 42 million barrels since the beginning of 1954. In mid-February, inventories of distillate fuel stood at 73¾ million barrels, 1¼ million barrels less than a year ago although at the first of the year they had been 16 million barrels greater. Stocks in the marketing area east of California were 2⅔ million barrels less than a year ago on February 13.

This has put distillate fuel oil in good condition. This improvement should encourage refiners to adjust their yields to manufacture less gasoline and more distillate oil.

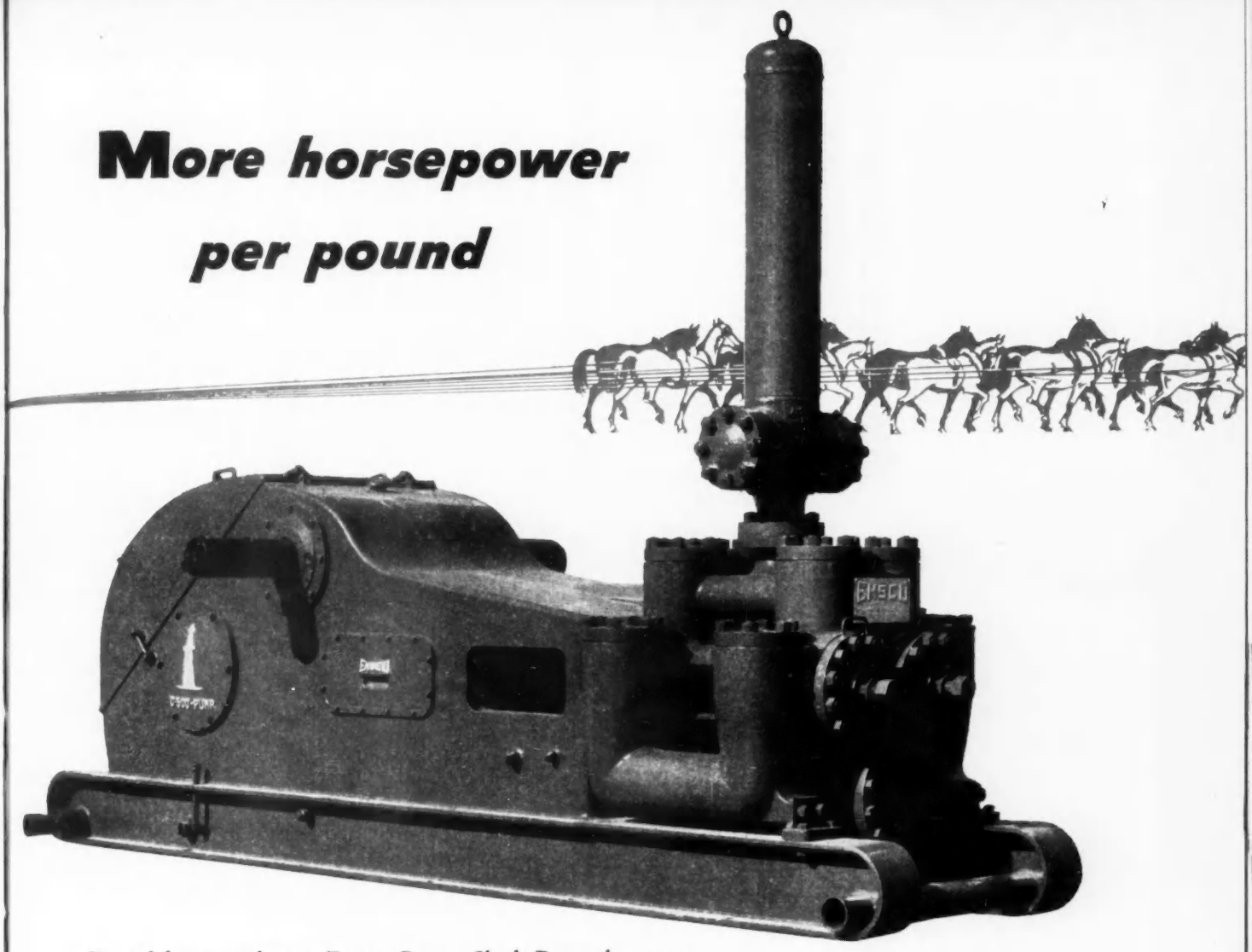
•

CRUDE OIL STOCKS also have shown much improvement. At the end of September, crude inventories had climbed to 289⅔ million barrels. This was too high. However, reduced production since September has reduced inventories to satisfactory levels. Crude stocks currently are down to 267 million barrels compared with 271½ million barrels at the beginning of the year.

As long as crude inventories are kept below 275 million barrels they are in good shape. It is to be hoped that the big increase in March crude production rates set by the Texas Railroad Commission is not the beginning of another period of producing too much oil. If stocks start climbing too rapidly, production should be cut enough to hold inventories to around 275 million barrels. This would prevent the necessity of having to undergo more drastic reductions later.

Improvements in the crude oil and distillate fuel picture leave gasoline as the industry's remaining economic problem. How serious this is to become will be known by the end of March.

More horsepower per pound



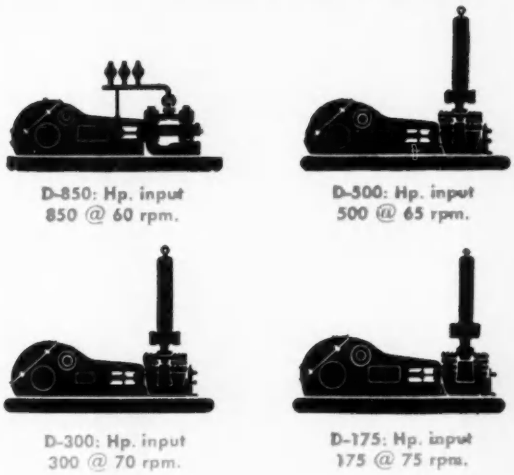
Pound-for-pound your Emsco Power Slush Pump has more pumping capacity than any other pump on the market today. And it is more compact.

This means less weight and bulk to move from location to location . . . greater economy in transportation . . . and easier handling in transit or at the rig.

Emsco design and *fabriform* construction places metal exactly where it is needed to form a rigid, light-weight frame. It permits the use of *steel* plates and shapes in place of bulky, heavy iron castings.

In addition to lighter weight, you get these advantages: 1) Heavy-duty roller bearings throughout. 2) Heat treated forged steel herringbone gears. 3) Automatic lubrication. 4) Emsco's *exclusive* exposed liners that enable you to detect and correct liner packing leakage before damage is done.

PUMPS TO MEET EVERY DRILLING NEED



D-850: Hp. input 850 @ 60 rpm.

D-500: Hp. input 500 @ 65 rpm.

D-300: Hp. input 300 @ 70 rpm.

D-175: Hp. input 175 @ 75 rpm.

EMSCO

REG U.S. PAT. OFF.

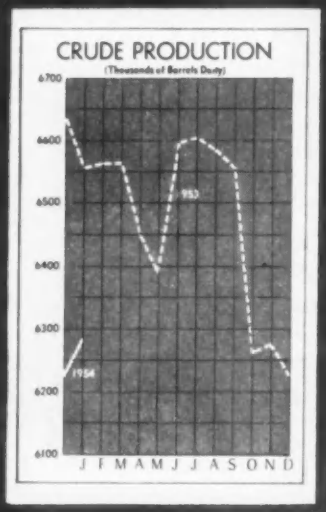
EMSCO MANUFACTURING COMPANY

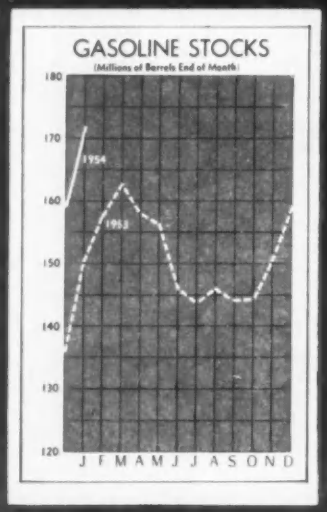
Houston, Texas • LOS ANGELES, CALIFORNIA • Garland, Texas

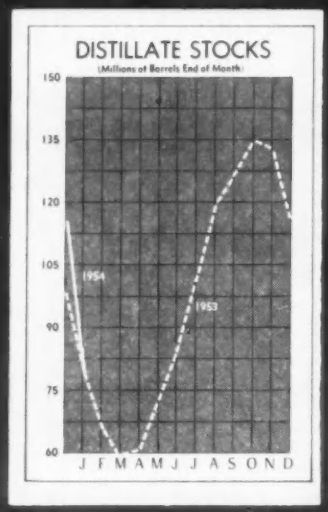
Distributors: Bovaird Supply Company, Tulsa, Oklahoma. Mid-Continent Supply Company, Fort Worth, Texas, and Edmonton, Calgary, Canada. *Export Distributor:* Mid-Continent Supply Co., Inc., 42 Broadway, New York 4, N. Y.

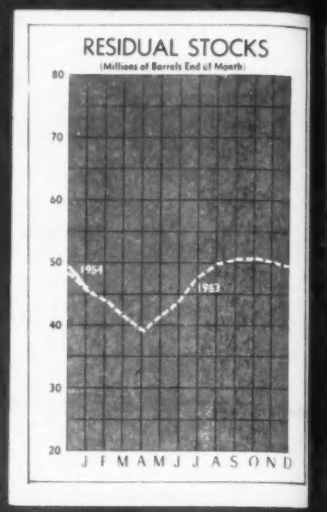
EMSCO SERVICE — Factory trained engineers, specializing in drilling problems, are available to help you keep your pumps operating at peak efficiency.

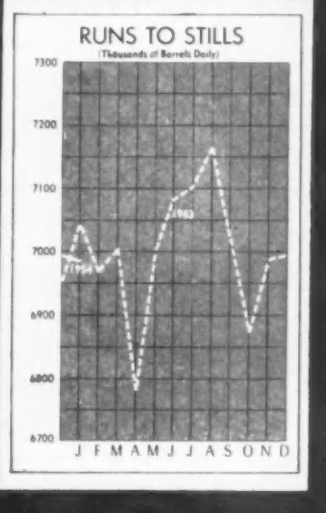
UNIVERSITY OF MICHIGAN LIBRARIES

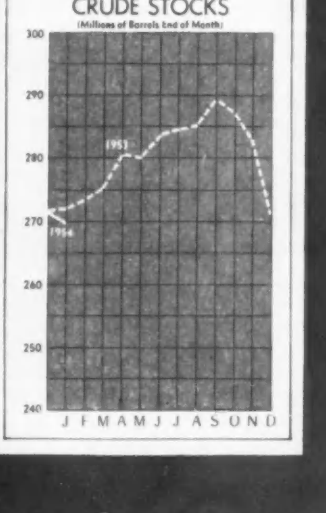












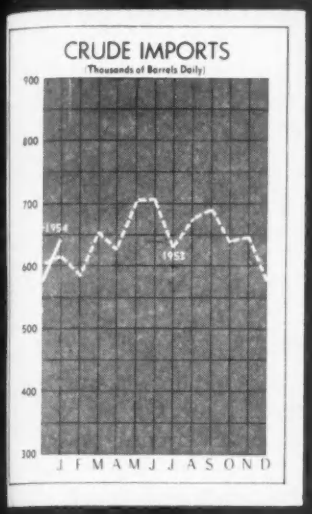
Petroleum Trends in the U. S. . . .

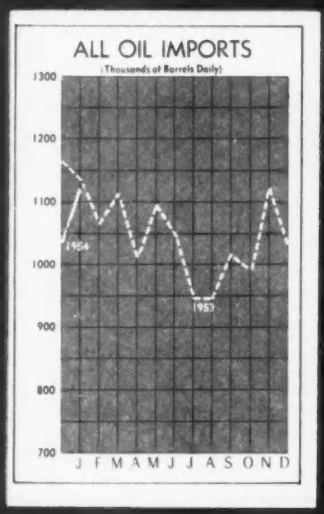
Drilling rigs continue decline . . .

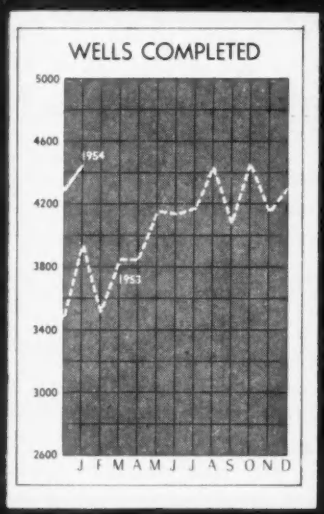
U. S. Crude Production by States

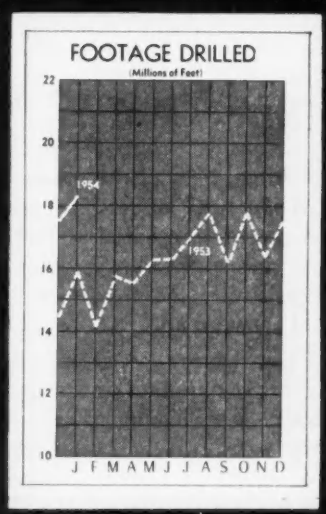
(Thousands of Barrels)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION		
	January, 1954	December, 1953	January, 1953	% Diff. January, '53-'54	January, 1954	January 1953	% Diff. '53-'54
Alabama	4.4	4.4	4.3	+ 2.3	136	133	+ 2.3
Arkansas	75.7	77.7	81.0	— 6.6	2,347	2,511	— 6.5
California	1,005.4	1,012.2	987.7	+ 1.8	31,169	30,618	+ 1.8
Colorado	112.0	108.5	80.7	+ 38.8	3,471	2,502	+ 38.7
Florida	1.5	1.5	1.5	.....	46	45	+ 2.2
Illinois	171.1	169.7	160.6	+ 6.5	5,304	4,978	+ 6.5
Indiana	32.2	33.0	35.1	— 8.3	998	1,089	— 8.4
Kansas	290.5	299.0	335.9	— 13.5	9,005	10,412	— 13.5
Kentucky	32.5	32.3	30.0	+ 8.3	1,008	931	+ 8.3
Louisiana	676.4	668.4	707.5	— 4.4	20,969	21,933	— 4.4
North Louisiana	108.8	108.2	121.5	— 10.5	3,375	3,768	— 10.4
South Louisiana	567.6	560.2	586.0	— 3.1	17,594	18,165	— 3.2
Michigan	33.1	33.6	34.1	— 2.9	1,027	1,058	— 2.9
Mississippi	93.1	95.2	98.8	— 5.8	2,885	3,062	— 5.8
Missouri	0.1	.....	0.1	.....	1	2	— 50.0
Montana	34.1	36.8	29.7	+ 14.8	1,058	920	+ 15.0
Nebraska	18.5	14.8	14.9	+ 24.2	574	462	+ 24.2
New Mexico	197.3	192.0	178.4	+ 10.6	6,116	5,530	+ 10.6
New York	11.6	11.9	10.8	+ 7.4	360	336	+ 7.1
North Dakota	13.9	13.1	14.2	— 2.1	433	439	— 1.4
Ohio	10.0	10.5	8.4	+ 19.0	311	261	+ 19.2
Oklahoma	526.4	530.6	552.3	— 4.7	16,319	17,121	— 4.7
Pennsylvania	24.5	25.2	29.1	— 15.8	759	903	— 16.0
Tennessee	.....	.....	.....	.....	1	1	.....
Texas	2,663.5	2,609.2	2,934.3	— 9.2	82,567	90,964	— 9.2
Dist. 1—South Central	39.9	39.0	37.4	+ 6.7	1,236	1,160	+ 6.6
Dist. 2—Middle Gulf	141.2	141.0	167.0	— 15.5	4,379	5,176	— 15.4
Dist. 3—Upper Gulf	441.2	436.9	499.7	— 11.7	13,676	15,489	— 11.7
Dist. 4—Lower Gulf-S.W.	246.7	245.4	264.0	— 6.6	7,646	8,184	— 6.6
Dist. 5—East Central	45.1	44.9	52.9	— 14.8	1,400	1,640	— 14.6
Dist. 6—Northeast	348.2	350.2	393.5	— 11.5	10,794	12,200	— 11.5
Dist. 7-B—North Central	121.5	120.5	112.2	+ 8.3	3,767	3,479	+ 8.3
Dist. 7-C—West Central	177.1	160.2	175.8	+ 0.7	5,490	5,449	+ 0.8
Dist. 8—West	839.2	810.6	954.7	— 12.1	26,014	29,597	— 12.1
Dist. 9—North	184.8	182.9	188.0	— 1.7	5,729	5,827	— 1.7
Dist. 10—Panhandle	78.6	77.6	79.9	— 1.6	2,436	2,475	— 1.6
Utah	4.5	4.5	5.0	— 10.0	139	155	— 10.3
Virginia	0.1	0.1	.....	.....	3	1	+200.0
West Virginia	9.1	9.2	6.9	+ 31.9	281	214	+ 31.3
Wyoming	240.5	231.0	214.0	+ 12.4	7,454	6,633	+ 12.4
Total United States	6,282.0	6,224.4	6,555.3	— 4.2	194,741	203,214	— 4.2









By CECIL W. SMITH, WORLD OIL Staff

Gasoline stocks at all-time peak . . .

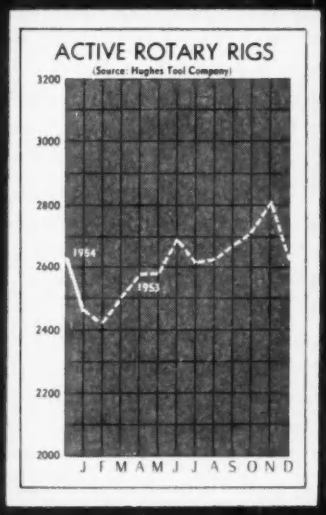
. . . Fuel oil stocks below 1953 level

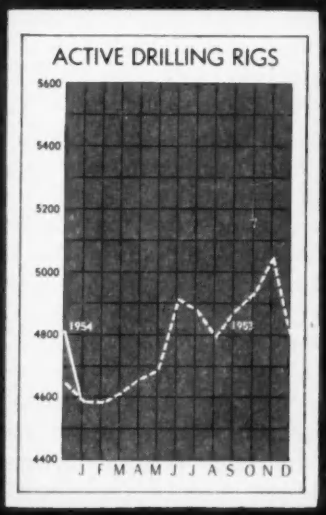
Crude Oil and Refined Products Trends

(Thousands of Barrels)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1951:											
December	6,182	6,646	255,783	3,150	134,867	1,442	86,619	1,313	42,853	423	834
1952:											
January	6,217	6,640	254,007	3,094	144,339	1,456	66,969	1,338	39,523	488	951
February	6,367	6,673	255,900	3,109	151,912	1,528	55,369	1,322	38,295	491	940
March	6,388	6,640	259,126	3,069	160,689	1,400	48,750	1,274	37,971	510	947
April	6,429	6,435	270,679	2,995	151,890	1,312	51,634	1,253	38,561	539	922
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,197	6,825	285,964	3,169	120,166	1,455	65,911	1,228	45,688	581	911
July	6,093	6,927	275,951	3,295	116,566	1,475	85,775	1,237	52,245	597	892
August	6,219	7,118	264,368	3,377	118,592	1,514	104,257	1,252	54,061	632	879
September	6,518	7,017	264,723	3,428	120,991	1,502	117,252	1,230	56,200	615	932
October	6,518	6,883	269,776	3,301	120,062	1,458	120,721	1,203	53,052	643	1,037
November	6,487	7,049	267,852	3,416	129,509	1,510	116,096	1,299	53,069	624	984
December	6,634	6,952	271,928	3,361	136,028	1,509	99,582	1,302	48,706	603	1,165
1953:											
January	6,555	7,042	272,250	3,384	150,518	1,528	80,655	1,307	45,910	616	1,135
February	6,562	6,969	273,589	3,379	157,873	1,505	67,167	1,275	44,178	586	1,066
March	6,531	7,002	275,665	3,319	162,731	1,489	59,802	1,256	41,600	655	1,112
April	6,446	6,781	280,487	3,282	158,032	1,424	61,349	1,219	39,572	628	1,010
May	6,390	7,002	280,308	3,459	156,415	1,400	73,706	1,197	41,795	703	1,096
June	6,595	7,081	283,715	3,467	146,196	1,462	84,504	1,238	43,801	707	1,050
July	6,603	7,103	284,976	3,583	143,916	1,441	102,394	1,224	47,966	629	946
August	6,583	7,163	285,352	3,592	146,050	1,437	119,542	1,222	50,007	672	946
September	6,557	7,023	289,614	3,521	144,184	1,448	126,709	1,203	50,516	692	1,013
October	6,262	6,872	287,541	3,437	144,495	1,462	135,409	1,184	50,820	639	990
November	6,277	6,987	283,021	3,528	150,747	1,463	133,381	1,223	51,267	648	1,120
December	6,224	6,992	271,554	3,532	158,921	1,447	115,666	1,211	49,542	575	1,037
1954:											
January	6,285	6,985	269,929	3,466	171,750	1,487	79,249	1,222	45,963	642	1,123
Jan. 1954 Change:											
In Month	+ 61	— 7	—1,625	—66	+12,829	+40	—36,417	+11	—3,579	+67	+86
In Year	—270	—57	—2,321	+82	+21,232	—41	—1,406	—85	+53	+26	—12
Week Ended:											
2-13-54	6,322	7,030	266,103	3,489	175,908	1,526	73,754	1,214	45,921	638	1,082
2-14-53	6,545	7,017	271,886	3,365	154,686	1,512	74,978	1,253	45,954	617	1,057

Source: Data for last two months from API; prior monthly data from Bureau of Mines.





UNIVERSITY OF MICHIGAN LIBRARIES

Broad View of Market Prompts Increase in Texas Allowable

A broad view of the present market situation was offered in statements and reports presented at the monthly statewide proration hearing of the Texas Railroad Commission at Austin on February 19.

Upon giving consideration to all the testimony and information submitted, the commission issued an order authorizing allowable crude production averaging 2,982,416 barrels daily in Texas for March, an increase of 159,266 barrels from the allowable on February 13.

The figure for March is indicated by the order's provision for 18 days of production for Texas fields in general, including East Texas; exceptions being 15 days for Scurry County's Kelly-Snyder field, 16 days for Pantex field of South Texas, and 9 days for Pickton field of East Texas.

The adopted program of 18 producing days was a compromise of varying recommendations by different crude purchasing companies but will result in more production than wanted by a majority of the purchasers, buying over half the crude in Texas. A schedule of 17 producing days in March, which would have increased the state's daily average allowable by 41,765 barrels, would have supplied the crude requirements of Humble Oil & Refining Company, The Texas Company, Stanolind Oil Purchasing Company, Pan American Refining Corporation, Continental Oil Company, the Atlantic Refining Company, and Tide Water Associated Oil Company, according to representatives of those companies.

A program of 18 producing days, as later adopted by the commission, was advocated as right to provide the crude wanted by Magnolia Petroleum Company (subsidiary of Socony-Vacuum Oil Company), Gulf Oil Corporation, and Sinclair Oil Corporation.

A March schedule of 19 days of production, which would have involved an increase of 264,000 barrels in the daily average allowable, was recommended by Shell Oil Company and Sun Oil Company representatives as being necessary to fill their requirements of crude.

Ernest O. Thompson, chairman of the Texas Railroad Commission, expressed the opinion that the current stocks of crude oil in the U. S. were not excessive. He cautioned, however, that "we are long on gasoline—very long." The increase in gasoline stocks to be expected in the latter half of February and in March will be considerable, he warned, "unless refiners of the nation show some restraint."

Ralph Dietler, of Stanolind, who asked for only 17 producing days in March, declared that the way to prevent surplus gasoline stocks was to avoid excessive production and movement of crude to the refineries.

George Goad, of Tide Water, also in favor of only 17 producing days, cited a report that gasoline stocks already had reached 176 million barrels and were still increasing. He recommended keeping Texas crude production at a conservative level for another month so as to keep inventories of gasoline at reasonable levels until April, when the problem of high gasoline stocks will be alleviated by seasonally increasing demand. Goad stated that even under a 17-day producing schedule for March, Tide Water would receive enough crude to sell 5000 barrels a day to other refiners.

Determination of the right amount of production that should be allowed in Texas is a very complex problem, and the Texas Railroad Commission is alert to all of the numerous pertinent factors involved. The demand for Texas crude production is determined primarily by the trend of petroleum consumption, but it is influenced greatly by the extent to which oil needs are supplied by production from other states, imports of crude and products, production of natural gasoline in all states, and the need for increasing or reducing stocks of crude and products.

At the mid-February hearing for setting March allowables, the commission released tabulations, based on reports from importing companies, indicating that imports of crude and products averaged 996,777 barrels daily in January. The importers estimated that they would import 1,076,604 barrels per day on average in February, 997,758 daily in March, 901,867 daily in April, 905,307 daily in May, and 895,200 barrels daily in June.

Independent producers naturally are critical of imports by major companies, and they charge that holding down domestic production encourages increased imports. Majors reply that they also are domestic producers and therefore want to maintain domestic production. The recommendations to the Railroad Commission on March allowables support the argument of the importers. A high allowable, with 19 producing days, was advocated by Shell Oil Company, an affiliate of two large importing companies. The 18-day schedule was supported by Socony-Vacuum and Gulf Oil Corporation, large importers but also large domestic producers. Only 17 producing days were advised by The Texas Company and affiliates of Standard Oil Company (New Jersey) and Standard Oil Company (Indiana), which are large importers as well as big domestic producers; but the 17-day program was endorsed also by Continental Oil Company, Atlantic Refining Company, and Tide Water, which are largely domestic producers.

At the February 19 hearing, Chairman Thompson of the Texas commission presented data showing that Texas and Wyoming are producing less oil than other states in relation to the proved crude reserves of the states. His figures showed that Texas held 51.70 percent of U. S. reserves but was producing only 42.00 percent of the total U. S. production. Wyoming held 4.00 percent of reserves and accounted for 3.87 percent of production. In contrast, Kansas accounted for 3.41 percent of U. S. reserves and 4.59 percent of U. S. production; Oklahoma 6.70 percent of reserves and 8.55 percent of production; Louisiana 8.40 percent of reserves and 10.26 percent of production; New Mexico 2.70 percent of reserves and 3.17 percent of production; California 14.30 percent of reserves and 16.30 percent of production; and other states 8.50 percent of reserves and 11.01 percent of production.

THESE 16 REASONS

SHOW WHY YOUR BEST BET IS A LANE-WELLS PACKER

Every part built to withstand heaviest service

Designed by oil-field men

Proved in service in every American oil field

Sealing element gives leak-proof packoff

Sealing element doesn't "vulcanize" to casing

Sealing element springs back to almost original dimensions

SLYDEZE slips don't "freeze" to cone

Dovetailed slips can't get out to "hang up" packer

Cross-cut wickers hold fast without shaving casing

Large by-pass for fast running in fluid

Valve seal operates even with junk on the seat

"Free-wheeling" slip rein ring

Full-diameter mandrel for easy tool passage

Fishing wickers on neck

Precision-milled threads

314 sizes and types . . .

. . . there's one that just fits your job!

Write for further information

LANE WELLS COMPANY

Engineered Packers

Tomorrow's Tools - Today!

LANE-WELLS *General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58*

LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

AP-702

UNIVERSITY OF MICHIGAN LIBRARIES

Vast Merger of Industry Labor Unions Appears a Step Nearer

In late February it was indicated that there would be success in the efforts to set up a giant international industrial union for workers in the oil and gas and related industries. The big labor union sought would merge numerous independent or company unions with various unions of the A. F. of L. and the strong Oil Workers International Union of the CIO.

Efforts to bring about the consolidation culminated in a convention of delegates from the interested unions in Philadelphia from February 15 through February 18.

The convention resulted in the adoption of plans for a huge Oil and Chemical Workers International Union, which is expected to have 1 million members within 3 to 5 years. The union as planned will embrace all divisions of the petroleum industry from wellhead to service station pump and in addition will include chemical workers, gas pipe line employes, coke manufacturing workers, and employes in atomic energy plants.

Spokesmen for the various unions stated at Philadelphia that the merger was based primarily on economic considerations, including a recognition that the future may bring a letdown in business and employment. Others said that the merger was encouraged by a current "tougher" attitude of managements toward organized workers, under the Eisenhower administration.

Some observers viewed the prospective merger as a long step toward company-wide and industry-wide bargaining in the petroleum and chemical industries, similar to that existing in the steel, automobile manufacturing, and coal mining industries. Heretofore, bargaining in the oil industry has been largely on a plant-by-plant basis, though one major company has a contract to negotiate on company-wide basis.

Attorneys familiar with oil industry labor relations have stated that the present plans for a consolidated union do not necessarily foreshadow company-wide or industry-wide bargaining. Even if the big union embraced all the employes of a company, that company could require bargaining on a unit-by-unit basis if it wanted to do so: In the big strike of 1952, oil companies successfully refused to be forced into company-wide bargaining.

Nevertheless, company-wide bargaining is an announced goal of the strong Oil Workers International Union. OWIU officials have declared that it is senseless and wasteful for a union to deal separately on every plant of a major oil company, each time dealing ultimately with the same management.

Oil industry managements have feared possible abuses of company-wide and especially industry-wide bargaining. Industry-wide strikes in steel and coal mining have seriously affected the public welfare, and oil industry executives fear that oil and gas industry strikes on nation-wide basis, affecting vitally needed fuels, might virtually paralyze the nation.

Taxes and Controls Gas Industry Problems

The natural gas industry, which has been growing and developing so phenomenally since World War II, has been confronted with some serious problems of regulation and taxation, and there is much uncertainty how these matters eventually will be settled.

Of considerable importance is the matter of taxation, which has been highlighted by the litigation over the "gathering tax" in Texas, a major source of gas.

The U. S. Supreme Court recently made a decision which invalidated the Texas "gathering tax" on interstate pipe lines. The court emphasized that the tax was on the act, by the purchasing pipe line, of "taking" the gas after production, gathering, and processing were completed and that the "taking" of the gas was so closely related to interstate movement that it was not subject to local taxing authority.

In Texas, the producers and purchasers of gas have been demanding that there should not be discriminatory taxes on gas, out of line with taxes on other resources and production. Whether or not Texas will seek to impose some new tax in lieu of the voided "gathering tax" remains to be seen.

The legislature is not in session, but will convene March 15 for a special session. Texas' Attorney General John Ben Shepperd suggested several ways of legislating more revenue from gas. He proposed a production tax of 1.5 cents per thousand cubic feet to replace the present tax of 5.72 percent of market value at the well, and an amendment of the conservation law, discouraging gas waste due to cheapness of gas by requiring that on gas bought for less than 10 cents per mcf, the purchaser must pay the production tax. Shepperd further proposed a stand-by provision, to be effective only if the previous two are contested, putting a statewide minimum of 10 cents on the price of gas at the well. Some now is bought for less than 5 cents, and the average is about 7 cents.

Also of great significance to the natural gas industry is the indication of recent Supreme Court rulings that producers of gas are subject to utility type regulation by the Federal Power Commission, under the Natural Gas Act. Oil and gas men say the law should be changed to exempt producers from FPC control, but whether the law will be changed is doubtful.

Sicily Well

Gulf Oil Corporation's well near Ragusa, Sicily, brought in initially for about 500 barrels a day, is expected to go into production this month. While the company would like to drill deeper in hope of finding a bigger reservoir, Gulf may produce the discovery well immediately for two reasons: Communists seeking to nationalize Italian and Sicilian oil discoveries said U. S. interests could not find oil, and that if they did the oil would not be produced in competition with other U. S. fields.

The Gulf discovery, drilled to about 6500 feet by American International Fuel & Petroleum Company on a block of 25,000 acres, is viewed as a discovery of major import to Italy, which uses about 20 times as much as its 2000-barrel-a-day domestic output.

Current geological reports indicate a major reservoir beneath the hilly terrain near Ragusa. Other firms active in Sicily include Anglo-Iranian Oil Company, Mediterranean Oil Company (Gulf and Macmillan Petroleum Corporation), Pacific Western Oil Corporation, and Montecatini.

SALT WATER INSIDE, TRAFFIC VIBRATION OUTSIDE— STAYS ON THE JOB

Salt water disposal lines run under the streets in Oklahoma City, where wells are located within the city limits. When steel pipe corroded, it was replaced by cement-asbestos pipe. After a few months, traffic vibration caused failure, and the streets had to be torn up again.

In September, 1951, 4½ in. O.D. "Fibercast" Thermosetting Reinforced Plastic Pipe was installed. It has remained in continuous, trouble-free operation ever since. Its BAKELITE Polyester Resin—glass-fiber construction is highly inert, mechanically strong, and shock-resistant. Corrosion and vibration problems are gone.

The same "Fibercast" pipe can carry gas, hydrogen sulphide-laden crude oil, and acid muds—needs no coating, wrapping, or cathodic protection. Its inner surface stays smooth, minimizing paraffin build-up, providing greater flow, and permitting the use of smaller diameters. Flow is even, with settling, surge, and back pressure reduced.

A 20-foot length of "Fibercast" pipe is light enough for one man to lift alone. Installation is fast, handling costs are low. Since the BAKELITE Polyester Resin is thermosetting, heat won't soften it. The pipe won't shatter, yet a hacksaw cuts it easily. Fittings and couplings for "Fibercast" pipe are also made of glass fibers and BAKELITE Polyester Resins, and have the same features.

"Fibercast" thermosetting reinforced plastic pipe is made by **Fibercast Corporation,** Sand Springs, Okla., and distributed by the **Youngstown Steel Products Co., The Continental Supply Co.,** and **Youngstown Steel Products Co.** of California.

BAKELITE
TRADE-MARK
POLYESTER RESINS
TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company
Division of Union Carbide Canada Limited
Belleville, Ontario

UNIVERSITY OF MICHIGAN LIBRARIES

Earnings Outlook For '54 Favorable

The outlook for earnings in the petroleum industry in 1954 is favorable. For industry as a whole, good earnings are anticipated. The oil industry should show results as good as average or better.

A moderate increase in demand for petroleum is expected. This will mean larger volumes of oils produced, refined, and sold and resultant increases in revenue.

Prices of crude oil will average higher for 1954 than 1953 if they hold to the present levels. The present postings were made at the middle of 1953, when increases of 25 cents a barrel were put in effect.

Prices of refined products have declined some in recent months and are in some danger of future weakness, with stocks comparatively large. However, product prices are above the averages of 1953, and unless serious market troubles develop, they will average higher in 1954 than 1953. The product prices were increased at the middle of 1953 along with prices of crude.

It is indicated that the earnings of oil companies, as well as other companies, will be helped in 1954 by the dropping of the excess profits tax.

For American business in the aggregate, earnings in 1953 were around 10 percent above those in 1952. The oil industry showed an increase of similar order, with the benefit of both an expansion in volume of business and the previously mentioned increases in prices of crude oil and products at the middle of 1953.

Brownell Adds to Iranian Confusion

Attorney General Brownell added confusion to the already confused Iranian oil situation by granting "limited" anti-trust clearance for U. S. oil companies' participation in an international combine to handle Iranian petroleum.

Optimism was initially high after Brownell apparently granted immunity to Standard Oil Company (N. J.), Socony-Vacuum Oil Company, Gulf Oil Corporation, The Texas Company, and Standard Oil Company of California.

The announcement was greeted in London diplomatic quarters as a "big step" toward solution of the Anglo-Iranian dispute.

Then, three days later, Brownell told newsmen that his original announcement did not constitute immunity from anti-trust prosecution, and further refused to clear up just what the status is.

Told that there is a feeling that his action, in effect, bans other than five major companies from purchasing Iranian oil direct, he commented that everyone should reserve their opinion until the matter is made public.

Meanwhile, from Teheran came the announcement that the first stage of Anglo-Iranian oil talks has ended successfully and the way is open for a final agreement, expected this month.

Imports Foes Due To Gain Support

Imports of petroleum are likely to be opposed more strongly—and effectively—in the future than heretofore. This prospect is indicated by the general opposition to imports of all kinds of goods in numerous industries.

The petroleum industry on a world wide basis now has substantial surplus producing ability, and supplies from abroad are seeking markets in the U. S. In other industries similar situations have developed. Many commodities and manufactured products are now being produced throughout the world in larger volumes than they can be absorbed readily by the world markets. These goods in many cases are seeking markets in the U. S., and U. S. producers are complaining that higher tariffs are needed to keep foreign goods, made with relatively cheap labor, from supplanting domestic goods.

Especially affected are the chemical manufacturing and electrical manufacturing industries, which are encountering strong competition from the reconstructed industries of Germany, Japan, Great Britain, and other countries, which were traditionally large suppliers before World War II.

Henceforth, as U. S. oil producers oppose imports of petroleum, they will have increasing sympathy from producers and manufacturers in other industries. Because of the wide criticism of imports, Congress naturally will become increasingly concerned about them and more sympathetic to those seeking increased tariffs and imposition of restrictions on imports.

Production-by-Fire Technique Explained

Almost 100 percent recovery of oil from an oil-bearing formation can be achieved by means of an underground heat wave produced by a fire in a formation. This is the possibility offered by a new, patented method of Sinclair Research Laboratories, Inc., according to engineers of that company.

In a report at the recent annual meeting of the petroleum branch of the American Institute of Mining and Metallurgical Engineers at New York, Bruce F. Grant and Stefan E. Szasz described a five year series of field tests of the method. The formation subjected to the heat wave treatment was "practically stripped of its original oil content," they stated.

Heretofore, geologists have estimated that as much as 50 percent of the oil in an average field was too tightly held by the reservoir rock to be recovered by conventional primary and secondary recovery techniques.

The heat wave tests were conducted by Sinclair in a shallow Oklahoma field, and underground temperatures are estimated to have reached 1000° F.

Over-all recovery efficiency of the process cannot be evaluated until the wave reaches producing wells two years hence. But "banking" of the oil ahead of the wave has been shown by exploratory drilling in the area of the tests, the authors said.

In a summary section, the AIMME paper said the Sinclair heat wave tests had shown:

- The feasibility of creating and propagating a combustion-supported heat wave through an oil-bearing reservoir rock.
- Practically complete depletion of the oil-bearing formation in the heated area, "a result which cannot be approached by any recovery method now in use."
- The oil present in the formation, with the exception of some residual, can be moved by the very front of the wave, before ignition temperatures are reached, and hence should be recoverable.

3 quality chemicals for superior Gas Scrubbing

Jefferson | monoethanolamine | *for sweetening natural and refinery gas*
diethanolamine
diethylene glycol | *for dehydrating natural gas*

Jefferson monoethanolamine, diethanolamine and diethylene glycol are produced at Jefferson's modern plant at Port Neches, Texas, and shipped from conveniently located distribution points at Port Neches, Houston, Chicago and Tenafly, New Jersey.
All three of these highest-quality chemicals are available for immediate delivery—in tank cars, tank wagons or 55 gallon drums. Our technical service staff will be glad to help you with any problems concerning their application. Write or call your nearest Jefferson representative.

Specialists in *essential chemicals from hydrocarbon sources*

Jefferson
CHEMICAL COMPANY, INC.
260 Madison Avenue, New York 16, N. Y.

Branch Sales Offices: 180 West Washington St., Chicago 2, Illinois; 318 Melrose Building, Houston 2, Texas
Sales Agent: Nelson A. Howard, Jr., 900 Wilshire Boulevard, Los Angeles 17, Calif.
Warehouse Stores: Tenafly, New Jersey; Chicago, Illinois; Houston, Texas

- Ethylene Oxide
- Ethylene Glycol
- Ethylene Dichloride
- Diethylene Glycol
- Monoethanolamine
- Diethanolamine
- Triethanolamine
- Nonyl Phenol
- Morpholine
- Ethylene Carbonate
- Propylene Carbonate
- Polyethylene Glycols
- Glycol Ethers

UNIVERSITY OF MICHIGAN LIBRARIES

U. S. Wells Completed During January, 1954

STATE or DISTRICT	NEW WELLS COMPLETED AND FOOTAGE DRILLED												Rigs in Operation		
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New Wells Jan., 1954	Total New Wells Dec., 1953	Total New Wells Jan., 1953	Percent Difference From Year Ago	FOOTAGE January, 1954	FOOTAGE January, 1953	Jan., 31, 1954	Dec., 31, 1953	Jan., 31, 1953
Alabama	1			2				3	9	9	— 66.7	14,246	49,484	7	3	8
Arizona										2	—100.0		3,822	2	2	2
Arkansas	31			15				46	65	46		141,210	155,098	41	39	31
California	158		7	63				228	209	227	+ 0.4	981,473	901,406	238	279	253
Colorado	36		3	58				97	58	47	+106.4	541,480	227,780	78	68	45
Florida				4				4	2	1	+300.0	21,485	4,120	3	4	3
Georgia				1				1				4,264		2	2	2
Idaho																1
Illinois	182			142				324	188	202	+ 60.4	836,787	515,097	207	245	152
Indiana	21			32				53	86	139	— 61.9	86,866	250,178	153	182	130
Kansas	153		25	145			3	326	361	361	— 9.7	1,147,834	1,271,067	406	403	460
Kentucky	44		18	46				108	112	71	+ 52.1	206,882	132,742	86	93	81
Louisiana	152	7	38	99				296	257	234	+ 26.5	1,988,692	1,542,826	225	252	226
North Louisiana	89		22	30				141	130	115	+ 22.6	429,146	430,581	47	54	49
South Louisiana	63	7	16	69				155	127	119	+ 30.3	1,559,546	1,112,245	178	198	177
Maryland														3	1	5
Michigan	23			38				61	55	59	+ 3.4	145,538	154,617	92	102	80
Mississippi	6	1	2	12				21	43	39	— 46.2	144,430	282,526	26	29	27
Missouri				3				3		1	+200.0	2,733	586	1	3	3
Montana	35		2	27				64	19	30	+113.3	231,073	139,797	30	48	59
Nebraska	16		4	17				37	14	30	+ 23.3	207,993	150,530	21	18	12
Nevada														4	4	1
New Mexico	49	1	36	28				114	102	151	— 24.5	620,913	848,825	130	149	187
New York	44				28			72	76	72		99,868	99,868	98	100	106
North Dakota	13			8				21	27	14	+ 50.0	137,511	106,586	24	28	30
Ohio	30		8	30				68	58	80	— 15.0	136,582	181,031	191	188	165
Oklahoma	418	2	28	231	7			686	741	503	+ 36.4	2,407,234	1,878,342	678	656	626
Pennsylvania	40		12	8	39	5		104	106	109	— 4.6	175,822	188,265	244	227	228
South Dakota				2				2	1			9,594		3	4	2
Tennessee																2
Texas	865	24	105	553	7	1	1	1,556	1,508	1,407	+ 10.6	7,252,354	6,478,362	1,261	1,328	1,352
Dist. 1—South Central	41		2	26				69	69	71	— 2.8	220,605	199,540	26	24	49
Dist. 2—Middle Gulf	33	1	24	28				86	89	70	+ 22.9	517,341	405,408	35	41	42
Dist. 3—Upper Gulf	69	5	2	58				134	146	133	+ 0.8	924,511	918,812	111	120	126
Dist. 4—Lower Gulf-S.W.	56	14	15	48			1	134	148	165	— 18.8	691,168	963,057	76	70	124
Dist. 5—East Central	6	1	1	7				15	17	32	— 53.1	57,984	129,104	6	9	22
Dist. 6—Northeast	14	1	13	20				48	51	47	+ 2.1	309,253	279,397	56	58	42
Dist. 7-B—North Central	125		6	133				264	229	266	— 0.8	900,935	863,653	143	150	130
Dist. 7-C—West Central	79		4	59				142	114	128	+ 18.3	698,260	638,020	146	144	151
Dist. 8—West	196	1	1	64				262	222	204	+ 28.4	1,612,285	1,141,867	309	333	298
Dist. 9—North	198		3	99	7	1		308	306	243	+ 26.7	1,012,497	821,926	257	264	282
Dist. 10—Panhandle	48	1	34	11				94	117	48	+ 95.8	307,515	117,578	96	115	86
Utah	1		2	1				4	6	5	— 20.0	24,271	28,431	20	15	25
Washington														1	1	
West Virginia	3		19	15				37	59	34	+ 8.8	101,003	99,601	198	195	200
Wyoming	86		5	33				124	105	43	+188.4	609,119	204,607	124	134	81
Total United States	2,407	35	314	1,613	81	6	4	4,460	4,267	3,916	+ 14.1	18,277,257	15,895,594	4,597	4,802	4,585
Total Western Canada	99		11	57			2	169	181	166	+ 1.8	693,859	669,210	153	171	163

4460 Completions . . .

A new high for January as 1954 gets off to a faster start than last year.

A NEW HIGH for wells completed in the initial month of the year was reached when 4460 new tests went into the records in January. Last year got away to a somewhat slower start as only 3916 new wells were completed in the opening month. That gave the current drilling program a 14 percent lead over last year's record activity, but with the number of active drilling rigs dropping back almost to the 1953 level, after a fast start, the coming months should see drilling holding close to the 1953 pace.

Practically all areas showed a gain in wells completed in the month over a year ago, and that was particularly true of the leading states. Texas, for example, the No. 1 drilling state, registered a 10.6 percent gain with its wells jumping from 1407 a year ago to 1556 for the month just concluded.

Still retaining its No. 2 spot was Oklahoma where tests numbered 686 to top last year's 503 by 36 percent. One of the most formidable increases occurred in Illinois where operations completed totaled 324 against 202 a year ago and that amounted to a 60 percent hike.

California's activity was maintained at the 1953 level, and the count was 228 wells to 227. Kansas was the only one of the top five drilling states to show a loss this year over last. Total tests in Kansas amounted to 326 and that proved to be a decline of 9.7 percent from last year's 361 wells.

The amount of footage represented in January's wells accounted for a slightly greater gain over last year's counterpart than did the total number of wells. A total of 18,277,257 feet were recorded for the month and that was a gain of 15 percent over the 15,895,594 feet drilled in January, 1953.

Average depth of each new well during the month amounted to 4080 feet, while the over-all average of last year's initial month was 4059 feet. Several of the leading states' wells were deeper on the average. Texas' wells averaged 4661 feet against last year's 4604. California's rose from 3971 to 4305, and Kansas' remained exactly the same at 3521 feet. On the other side of the ledger were Oklahoma with an average depth drop from 3734 to 3509 and Illinois with a decline from 2550 to 2507 feet per well.

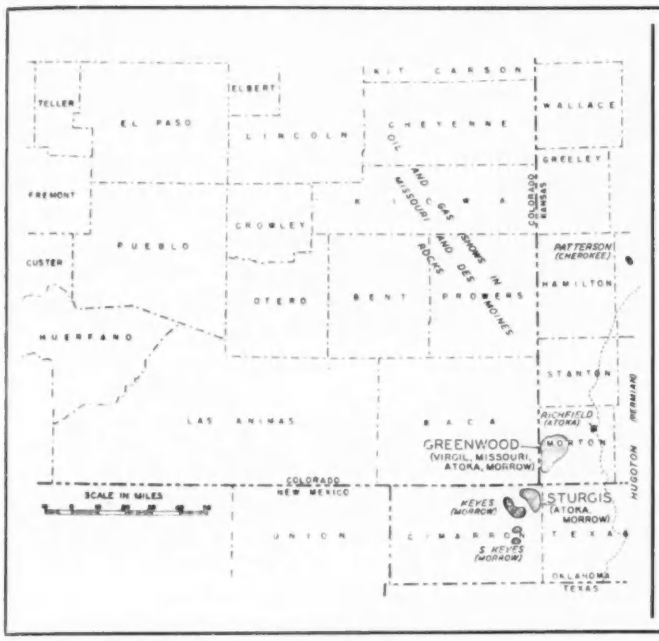


Fig. 1—Permian and Pennsylvanian oil and gas pools adjacent to Southeastern Colorado. (Adapted from Figure 22, *Bulletin AAPG*, Vol. 37, No. 5.)

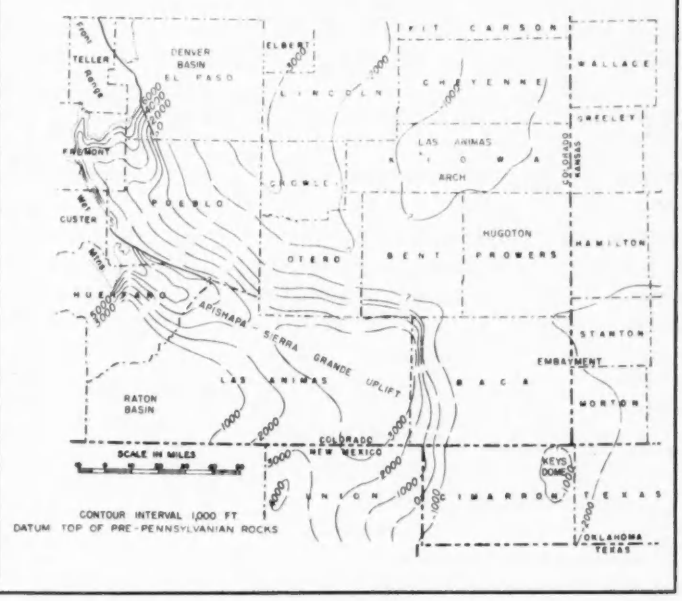


Fig. 2—Structure of pre-Pennsylvanian rocks in Southeastern Colorado.

SOUTHEASTERN COLORADO

Gas Developments Enhance Prospects

• Here's a geological study of the occurrence of Permian and Pennsylvanian rocks of area.

• It's designed to help the operator and the geologist better evaluate the possibilities.

By ANTHONY GIBBON, WORLD OIL Staff

POSSIBILITIES THAT commercial oil and gas may be developed in the Permian and Pennsylvanian beds of Southeastern Colorado have been greatly enhanced as a result of new gas strikes in the Oklahoma Panhandle, and continuing development of the Greenwood gas field in Morton County, Kansas, both adjacent to Southeastern Colorado (Figure 1).

These new developments emphasize the importance of presenting additional geological information on the occurrence and correlation of the Permian and Pennsylvanian beds. Oil and gas have not been discovered as yet in those beds in Southeastern Colorado, although several fields have been developed in the adjacent areas of Western Kansas and the Oklahoma Panhandle.

The most important is the Hugoton gas field, largest gas field in the world, which produces from lower Permian beds and covers much of Southwestern Kansas and parts of the Oklahoma and Texas Panhandles. Other producing areas include the Patterson pool in Kearney County, Kansas; the Richfield pool in Morton County, Kansas, and the Keyes and South Keyes pools in Cimarron County, Oklahoma. These areas produce oil and gas from unconformity sands on local structures—the Patterson produces oil from the basal Cherokee sandstone, and Keyes and South Keyes produce oil and gas from the basal Morrow sandstone.

The newest area to produce from Pennsylvanian beds and adjacent to Southeastern Colorado is the active Sturgis gas field discovered by Coltexco Corporation earlier this year at its Purdy 1, five miles northeast of the Keyes gas district. Gas is being produced from both the Atoka and Morrow formations. Last March, Cities Service Oil Company completed a new Keyes sand well at Sturgis and the development has been so consistent that the area now extends into Townships 5 and 6 North, 9-ECM. The Coltexco well tested more than 33½ million cubic feet of gas per day and the Cities Service well tested 5.2 million.

Gas from Sturgis contains a much higher British thermal unit content than that produced from the nearby Keyes area. The gas produced at Keyes is so low in btu content that its disposition presents a difficult problem. Gas from North Sturgis may now be mingled with the lean prod-

UNIVERSITY OF MICHIGAN LIBRARIES

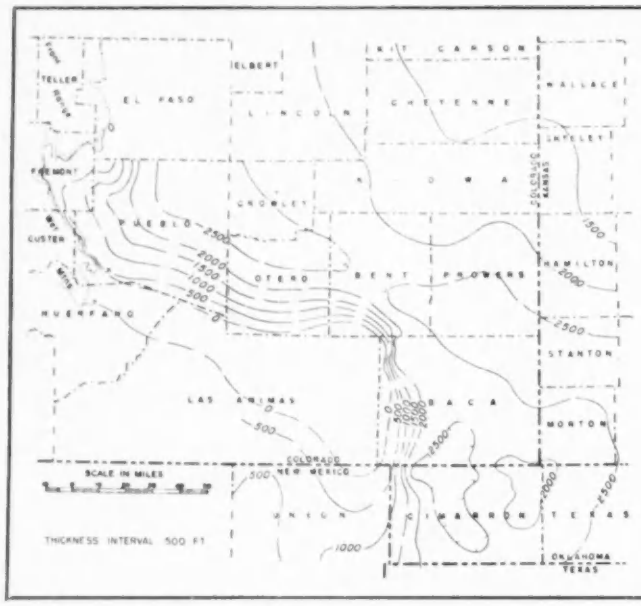


Fig. 3—Thickness of Pennsylvanian rocks in Southeastern Colorado.

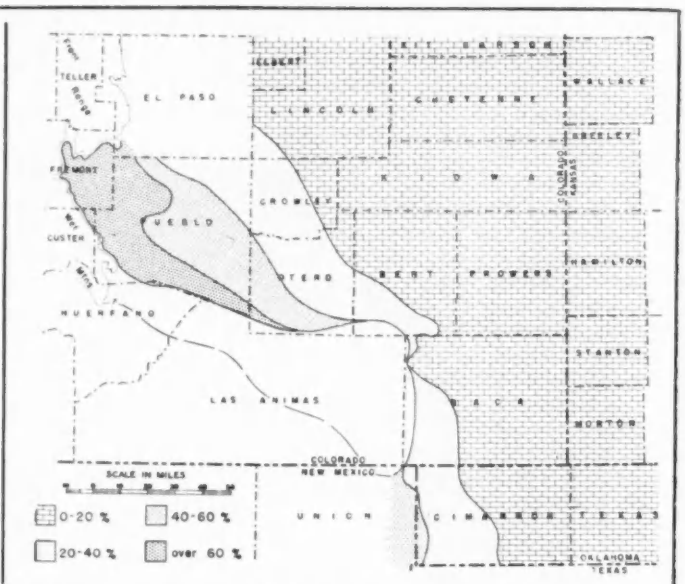


Fig. 4—Distribution of coarse clastics in Pennsylvanian rocks of Southeastern Colorado.

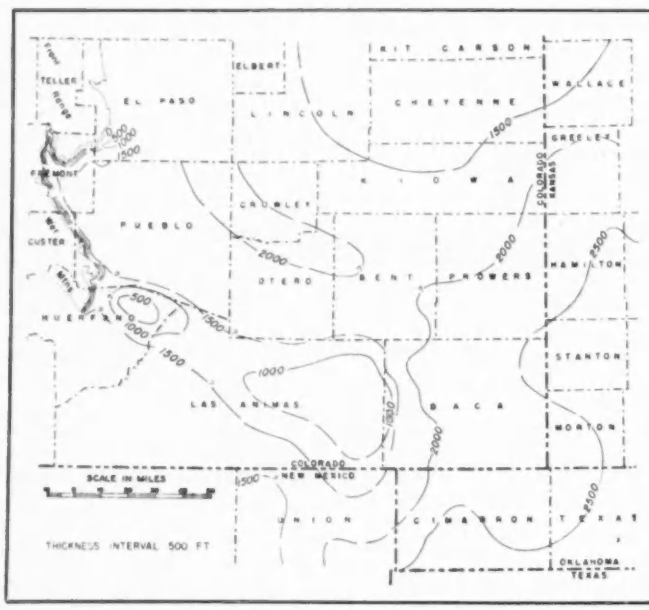


Fig. 5—Thickness of Permian rocks in Southeastern Colorado.

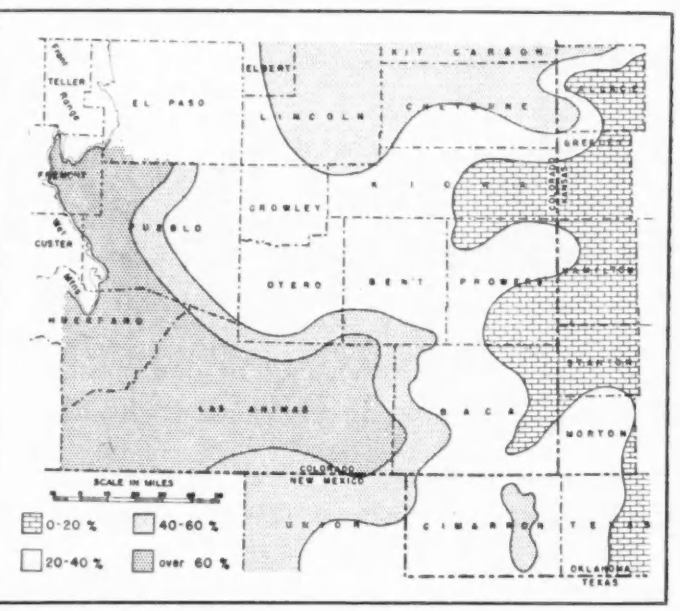


Fig. 6—Distribution of coarse clastics in Permian rocks of Southeastern Colorado.

uct from the Keyes area, enabling Keyes gas to find a market.

The most significant development in the area is the Greenwood gas field discovered by Cities Service and which some call "Little Hugoton." In fact, geologists declare it is the most significant gas discovery in years. Greenwood is in Morton County, Kansas, just across the line from Southeastern Colorado, and produces from the basal Morrow, Atoka, Missouri and Virgil rocks of Pennsylvanian age. Its development has been so rapid that it has expanded to cover most of Township 33, Ranges 42 and 43.

The first well in the area was drilled on a seismic structure and completed as a gas well in the Morrow sandstone at approximately 4900 feet. Subsequent drilling proved this reservoir to be relatively small and it was defined on the north by a well which was subsequently plugged back and completed in the Topeka and Lansing-Kansas City limestones for an open flow of 15.8 million cubic feet daily.

To August this year, Cities Service has completed 28 wells in the Greenwood gas field with a total open flow of almost 583 million cubic feet of gas daily. This total represents a per-well average open flow of more than 23 million cubic feet daily.

These new developments in Pennsylvanian beds in areas adjacent to Southeastern Colorado emphasize the advantage to operators and geologists alike of obtaining all available information on the occurrence and correlation of these important reservoir beds of the region, so as to enable them to more correctly evaluate the future possibilities of the area. The following digest of a paper[1] which contains this information is presented to World Oil readers to fill this need.

Structural Features. The structural

backbone of southeastern Colorado is formed by the Front Range, the Wet Mountains, and a buried ridge in the pre-Cambrian basement that extends from the Wet Mountains southeastward to the eastern border of Las Animas County, where it is offset southward into New Mexico, possibly connectinng with the buried Amarillo Mountains of the Texas Panhandle and the exposed Wichita Mountains of western Oklahoma. Major faults, perhaps in part extensions of the Ute Pass and Wet Mountain faults, may be associated with the steep dips along the north and east flanks of the buried ridge. In southeastern Colorado this ridge is broken into two features that have separate names—the "Apishapa uplift" for the structurally high area in eastern Huerfano County and northwestern Las Animas County, and the "Sierra Grande uplift" for the structurally high area in eastern Las Animas County, Colorado, and western Union County, New Mexico. The term "Apishapa-Sierra Grande uplift" is used in this article to indicate the essential unity of these features, which served as sources of sediment during most of Pennsylvanian and Permian time.

Another important positive feature of the region, although of different origin, is the Las Animas arch which, in the Mississippian rocks, is a southwestward plunging anticlinal nose in Cheyenne and Kiowa counties, Colorado, separated from the northwestward-trending Apishapa-Sierra Grande uplift by a saddle (Figure 2). This same feature is represented in the Permian rocks by a broad arch plunging off the Sierra Grande uplift from southern Bent County northeastward across Kiowa, Cheyenne, and Kit Carson counties. These positive features are flanked by parts of three major structural basins—the Hugoton embayment of the Anadarko basin, the Denver basin and the Raton basin.

Correlations. A summary of the correlations established across southeastern Colorado is shown in Table 1. The Lykins formation of the Front Range is correlated with the rocks of Guadalupe age and the upper half of the Nippewalla group of Kansas. The lower and upper "crinkly" limestone members are approximately equivalent to the Blaine formation and the Day Creek dolomite of Kansas. The Lyons sandstone of the Front Range is represented in Kansas by the Harper, Salt Plain, and Cedar Hills formations. The Fountain formation is equivalent to the Summer group and the Wolfcamp series of the Permian system and all rocks of Pennsylvanian age. The "contact limestone" at the top of the Fountain formation in the Red Creek area probably represents the western extremity of the Stone Corral dolomite. The Glenn Eyrie shale member of the Fountain, exposed only near Colorado Springs, is correlated with rocks of Morrow age.

TABLE 1

Correlation of Permian and Pennsylvanian Rocks Along Southern Front Range of Colorado with Their Kansas Equivalents

WESTERN KANSAS	SOUTHERN FRONT RANGE OF COLORADO
Permian rocks Rocks of Guadalupe age Taloga formation* Day Creek dolomite Whitehorse sandstone Rocks of Leonard age Nippewalla group* Dog Creek shale Blaine formation Flowerpot shale	Lykins formation Upper "crinkly" limestone beds Lower "crinkly" limestone beds
Cedar Hills sandstone* Salt Plain formation* Harper sandstone	Lyons sandstone
Sumner group (Stone Corral dolomite at top)	Fountain formation ("contact ls." at top in Red Creek area)
Permian rocks Rocks of Wolfcamp age Carboniferous (Pennsylvanian) rocks Rocks of Virgil age Rocks of Missouri age Rocks of Des Moines age Rocks of Atoka age	
Rocks of Morrow age	Glen Eyrie shale member of Fountain formation

* These names used by the Kansas Geological Survey are not accepted by the Committee on Geologic Names, United States Geological Survey.

Distribution and Lithofacies Pennsylvania Rocks. The maximum thickness of Pennsylvanian rocks penetrated by wells in southeastern Colorado is about 2700 feet in the Hugoton embayment and about 2500 feet in the Denver basin (Figure 3). Greater thicknesses are present both farther southeast in the Hugoton embayment and perhaps farther northwest in the Denver basin. McLaughlin measured almost 4500 feet of combined Fountain and Glen Eyrie rocks exposed along Fountain Creek west of Colorado Springs. However, this total includes the upper part of the Fountain formation, which is believed to be Permian in age. The unconformity between the Pennsylvanian and Permian rocks, which is fairly apparent in western Kansas and easternmost Colorado, cannot be recognized in the coarse arkosic clastics along the Front Range. The unconformity at the base of the Pennsylvanian is obvious on the surface and in the subsurface because the basal sandstone or conglomerate rests with angular discordance on pre-Cambrian, Cambrian, Ordovician, and Mississippian rocks as a result of regional overlap.

The Pennsylvanian rocks exhibit a marked change of facies from a dominantly limestone and shale sequence (marine-shelf facies) in western Kansas and easternmost Colorado to an arkosic sandstone and shale sequence (mixed continental and near-shore marine facies) along the Apishapa-Sierra Grande uplift, the Wet Mountains, and the Front Range. This westward increase in clastic material is depicted in Figure 4 by patterns showing the approximate percentage and distribution of clastic material larger than 1/16 millimeter.

Figure 4 shows that a landmass, herein referred to as the Apishapa-Sierra Grande landmass, existed throughout Pennsylvanian time in the northeastern half of Las Animas County and adjacent parts of Huerfano, Otero, Bent, Baca, and Union counties. This landmass probably connected with the Wet Mountains and the Front Range, forming a single positive element plunging southeast. Rocks containing more than 60 percent of coarse clastics and as much as 45-65 percent of arkosic material fill the Canon City embayment

UNIVERSITY OF MICHIGAN LIBRARIES

and flank the western part of the Apishapa-Sierra Grande landmass on the north. Rocks of similar composition are present on the south side of this landmass, but the percentage of course clastic material in these rocks is not known because of the lack of samples from the few wells drilled in the area. The northeastern part of landmass is flanked by rocks containing less than 40 percent of coarse clastics and less than 10 percent of arkosic material.

The relatively smaller amounts of coarse clastics and arkosic material on the northeast flank may be due in part to lower relief of the eastern part of the landmass and in part to the character of the rocks exposed to erosion on the landmass. The western half of the landmass, along the Wet Mountains and the Front Range, had a terrane of pre-Cambrian igneous and metamorphic rocks during most of Pennsylvanian time. The eastern half of the landmass, however, exposed only Cambrian, Ordovician, Mississippian, and some Pennsylvanian (Morrow) sedimentary rocks to erosion after the major uplift early in Pennsylvanian time.

The assumption that Pennsylvanian rocks covered the eastern half of the landmass at different times and were stripped off by later erosion is another explanation that must be considered. However, maps of the post-Morrow subdivisions of the Pennsylvanian show distribution patterns similar to this, and none shows a large amount of coarse clastics and arkose around the northeast part of the Apishapa-Sierra Grande uplift that would suggest reworking of earlier Pennsylvanian detritus near the shore. The possibility that such uplift and stripping could have taken place just prior to Permian deposition exists, but the distribtuion of the coarse clastics and the arkosic material in the Permian rocks does not suggest this. Furthermore, no evidence of a major uplift at the end of Pennsylvanian time has been found in the area.

Permian Rocks. Permian rocks are buried to depths of more than 2700 feet in the Hugoton embayment and attain a thickness in excess of 2600 feet (Figure 5). The maximum thickness penetrated by wells in the southern part of the Denver basin is about 2000 feet in Crowley and Bent counties. About 200-1500 feet of Permian deposits cover the Apishapa-Sierra Grande uplift.

In the Hugoton embayment, the Permian sequence consists of a lower carbonate (offshore marine) facies and an upper evaporite and siltstone (relict sea) facies. Westward the lower carbonate facies changes into arkose and siltstone (continental and near-shore marine) facies, and the upper evaporite and siltstone facies changes to a dominantly sandstone and siltstone (continental and littoral) facies.

The coarse clastics predominate in the Permian rocks along the mountain front and over the Apishapa-Sierra Grande uplift (Figure 6). The amount of arkose in these rocks increases abruptly on the flanks of these features from less than 10 percent to more than 60 percent. Most of the Permian rocks in the basin are not arkosic; any arkose present is ordinarily at or near the base. This suggests decreasing erosive power of the streams and waves throughout Permian time, and the gradual shallowing of the seas by evaporation.

Depositional History. At the beginning of Mississippian time, the Apishapa-Sierra Grande uplift, the Wet Mountains, and the Front Range were relatively low landmasses flanked on the north and east by a broad and shallow basin that included the area of the present-day Las Animas Arch. The maximum extent of the Mississippian seas was reached during middle Mississippian time, when limestones of Meramec age overlapped the older beds along the postive elements and probably extended over most of the landmasses on which the limestones are now absent owing to subsequent uplift and erosion. Gentle upwarping in the region at the close of Meramec time caused the retreat of Mississippian seas into the Hugoton embayment, where rocks of Chester age were deposited.

At the beginning of the Pennsylvanian Morrow time, the sea readvanced upon the flanks of the low landmasses, bringing clastic material from the southeast to form the initial deposits of glauconitic sandstone. Limestone was then deposited over a wide area before the sea began retreating slowly, leaving lagoonal-type green and black shales and some thin lignite layers. Near the end of Morrow time, major uplifting accompanied by faulting took place along the Apishapa-Sierra Grande uplift and the mountain front. The Ute Pass fault, which may have been preexistent, probably became a dominant feature, creating a scarp from Cheyenne Mountain near Colorado Springs southeastward toward or even beyond Pueblo. The Wet Mountain fault may have originated or been accentuated at this time. Additional faulting probably took place along the eastern side of the Apishapa-Sierra Grande uplift in Baca County. This uplifting created a trough extending from the Front Range into the Hugoton embayment of the Anadarko basin.

Atoka seas filled this trough, depositing dark limestone and shale beds in the off-shore marine waters and coarse arkosic clastics along the fault scarps and the flanks of the Sierra Grande uplift. The end of Atoka time was marked by renewed but less pronounced uplift, with possible additional faulting, permitting the Des Moines seas to invade the Canon City embayment. The trough, originated at the end of Morrow time, continued to be filled with coarse arkosic clastics while the broader parts of the basin received limestone and shale sediments. The Des Moines seas expanded farther than the seas of Atoka time, leaving rocks of Des Moines age resting upon rocks of Morrow and older age along the flanks of the basin.

The withdrawal of Des Moines seas permitted some erosion of the rocks of Des Moines age before the invasion of the Missouri seas, which continued the advance upon the positive elements and moved farther into the Canon City embayment. Fewer clastics of all sizes and less arkose were produced during Missouri time. The marine limestones were thicker and more extensive than in earlier Pennsylvanian time. Near the close of Missouri time, gentle upwarping took place, causing the seas to retreat temporarily and culminating in the creation of a broad arch northeasterly along the trend of the present-day Las Animas arch. Virgil seas overreached the previous shorelines, probably completely filling the Canon City

Continued on Page 107

DALLAS ★

SSC's DALLAS DISTRICT OFFICE

Seismograph Service Corporation's field operations are closely supervised from conveniently located district offices. These offices retain in the area specialized local experience augmented by the facilities of an organization operating world-wide.

The Dallas District Office of SSC offers this "on the spot" service for those interested in seismic and gravity surveys in the Texas area.

For full information concerning contract rates and crew availabilities contact Seismograph Service Corporation, 431 Fidelity Union Life Building.

SEISMIC SURVEYS – GRAVITY SURVEYS – PILOT CREWS – LORAC

Seismograph Service Corporation

TULSA, OKLAHOMA, U.S.A.

WORLD-WIDE EXPERIENCE

UNIVERSITY OF MICHIGAN LIBRARIES

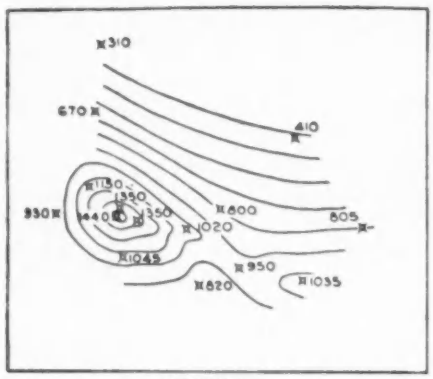


FIGURE 1

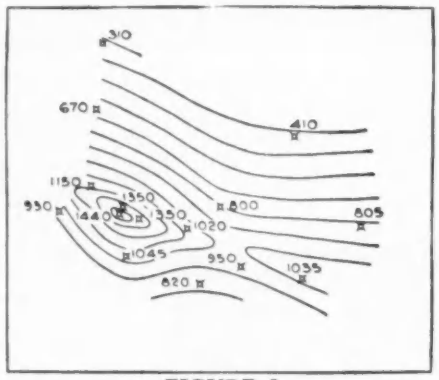


FIGURE 2

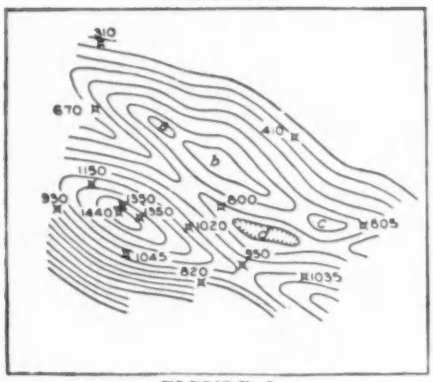


FIGURE 3

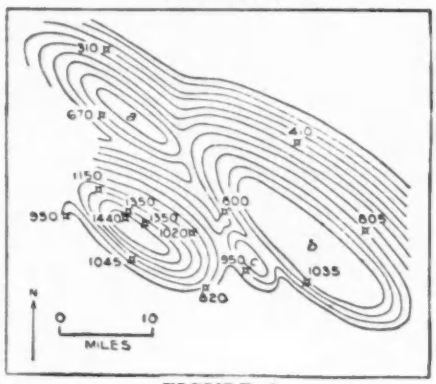


FIGURE 4

Four interpretations of subsurface structure, all based on same data obtained from same wells. On each map the elevation of key bed is given at locations of all wells. In Figure 1, spacing is mathematically determined; in Figure 2, although proportionate spacing between wells controls the contouring for the most part, some latitude of interpretation has been employed in order to make the form of structure look a little more reasonable. In Figures 3 and 4, equal spacing of contours has governed, the assumption being made that dips are everywhere essentially equal, which of course is unwarranted. Note that in both Figures 3 and 4, certain anticlines (a, b and c) and synclines (d) appear, whereas they are entirely absent in Figures 1 and 2. Contouring such as that in Figures 3 and 4 is not justified and should be discouraged.

Contouring Is Important

Here are ten basic rules which will help promote more accurate subsurface structural mapping.

By E. J. HANDLEY, Executive Vice President,
Midwestern Geophysical Laboratory, Tulsa

THOUSANDS OF DOLLARS frequently are spent to accumulate geologic and seismic data which ultimately are placed on subsurface structural maps, and these data are contoured in a matter of minutes.

One can generally take the same set of basic data and derive considerably different contoured subsurface structural maps therefrom. It is for this reason that contouring is so important and should be given considerably more emphasis than it generally receives.

The following rules and guides for subsurface contouring are presented to promote more accurate mapping work. The success or failure of an important wildcat prospect may be determined by the accuracy of the "picture" presented. By stricter observance of these rules and guides the geologist, geophysicist and engineer can increase the accuracy of his interpretation of data which have been obtained at substantial cost to the operator.

1. Maps are generally drawn for areas that are located in regional basins, and unless precisely on the synclinal axis, some regional dip will probably prevail over the area. In an area with a regional dip, all uplifted areas must extend the contours "away" from the regional, thus widening the contours in the vicinity of the uplift, forming a nose. If the uplift is sufficiently great, closures will occur.

A reentrant must occur on each side of an uplifted area. The axis of the uplift may tend to parallel the strike, thus reducing the magnitude of the reentrants; and the uplift may be asymmetrical, so one of the reentrants may be more pronounced than the other; but if an uplift occurs creating a nose or a closure, some evidence will be seen for a reentrant on each side of the uplift.

2. Although topographic maps may be sharp and irregular, and although some subsurface maps may be on topographic type surface, e.g., if a disconformity is being mapped, most subsurface maps should represent just that — a "sub-surface." Such maps should not show the angularities that result from mechanical contouring. If some smooth surface is first warped and bent, and then lines drawn on the rumpled sheet at points of equal elevation, it is seen that the resulting lines are in a pleasing proportion.

Contour lines must become farther apart in areas of noses or reentrants, and must become closer together down-dip from an uplift, to compensate for the flattening. Uplifts in an area of regional dip may produce many closed highs, but there will be few closed lows. Closed lows are relatively rare, and elongated closed lows may be indicative of faulting.

3. Contour lines generally have a tendency to flare out and then restrict tightly in a relatively flat area, if the contour interval is small

in proportion to the average relief. Contour lines thus appear to form many "feet," but few "fingers."

4. A few sheets of paper will lie nearly flat on a table, while a ream of the same paper will warp from little horizontal or vertical force. In areas where the basement is shallow the contours may approach straight lines, especially if an appreciable regional dip is present, whereas in deep basins where the sedimentary section is thick, there is generally a distinct grain to the structure, creating alternating noses and reentrants.

5. Faults frequently serve as boundaries separating areas of different "types" of structure and therefore frequently occur at abrupt changes in strike. Relatively long, narrow areas of steep dip may be an adequate representation of faulting.

6. Subsurface data should always carry a quality grade, so that the data may be properly evaluated, but once a value is placed on the map, it must be contoured as if it were perfect. For example, if a position carries a value of +420 feet VP, and if one is contouring on a 25-foot contour interval, then in the immediate vicinity of that location the +425-foot contour lines must be relatively close to the position, and not the +400-foot contour line. This is a fundamental concept, and one must not compromise the data in contouring—either contour the data properly, or leave the value off the map.

7. Except in extremely complex areas of steep dips, where faulting is prevalent, the sedimentary section for any local area may be considered to consist essentially of alternating layers of rocks that are nearly parallel, and maps on various horizons may be expected to show the same trends. On any given horizon the trend peculiar to that area should be apparent, and features at right angles to that trend will be exceptional.

8. In contouring isochore (equal interval) or isopach (equal thickness) maps, data may be missing at many locations, because of data missing on either the top or bottom horizon maps. It should be recalled that if the two horizon maps are superimposed as tracings, values can be read for the interval map at every location where the contour lines on the two maps intersect, the interval map value being merely the difference in the contour line values at the point of intersection. Similarly, deep values may be obtained by superposition of a shallow horizon map and an interval map.

9. Certain rules may be formulated in reference to the effects of convergence on local structures. Anticlinal axes transverse to the direction of general convergence are shifted toward the direction of convergence, away from the direction of divergence, in successively lower beds. Synclinal axes are shifted in the opposite direction under similar conditions. Dips toward the direction of convergence are lessened in the lower beds, and dips toward the divergence are steepened in the lower beds. In either case, gentle dips in the upper beds may be reversed in lower ones.

10. The validity of contouring can be tested by its predictability. If the contouring could be done perfectly, no changes in the contour lines would be required with the subsequent accumulation of data. —**The End**

Southeastern Colorado

Continued from Page 104

embayment for the first time since the major uplift that preceded Atoka time.

Little tectonic movement between Pennsylvanian (Virgil) and Permian time is discernible near the positive areas, although some clastics mark a break in the limestone facies offshore. During the Permian time, the Apishapa-Sierra Grande landmass was completely covered by the seas, and shorelines remained stable in late Permian while a beach sand known as the Lyons sandstone developed along the emergent areas. This was followed perhaps by a small advance, and then a general retreat of the seas due to evaporation.

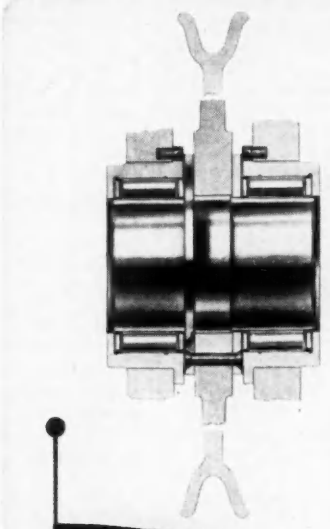
REFERENCE

[1] Maher, J. C., "Permian and Pennsylvanian Rocks of Southeastern Colorado" Bulletin of the American Association of Petroleum Geologists, Vol. 37, No. 5 (May, 1953).

Acknowledgment

Permission to present this digest from the paper: "Permian and Pennsylvanian Rocks of Southeastern Colorado" by J. C. Maher was granted by the American Association of Petroleum Geologists and the courtesy is gratefully acknowledged.

STANDARD
OF THE
PETROLEUM INDUSTRY
Since 1905



Regan *time proven*
DUAL BEARINGS

. . . for greater bearing life and longer wire line life. With Regan exclusive, rotating inner race Dual Bearings, each sheave has an integral rotating pin which distributes bearing wear around the entire area of the pin. Bearings on *each side* of the rotating pin prevent oscillation of the sheave. This construction permits use of smaller bearings which enables the block to operate at greater speed with less friction and minimum wire line slippage. Exclusive Regan long-lived Dual Bearings are embodied in all Regan Crown and Traveling Blocks.

Write for detailed information.

50

Regan
Forge & Engineering Co.
SAN PEDRO, CALIF.
FORT WORTH, TEXAS
Exclusive Mid-Continent and Export Distributor:
MID-CONTINENT SUPPLY CO.
General Offices: Fort Worth, Texas
Quality - Wrought on the Forge of Experience

UNIVERSITY OF MICHIGAN LIBRARIES

Results of Exploratory Drilling, January, 1954, by States

State or District	JANUARY, 1954—1953																		
	PRODUCTIVE TESTS											UNPRODUCTIVE TESTS					Total Exploratory Tests	
	New Fields			New Pays			Extensions			Total Productive					Total Dry			
	Oil	Dist.	Gas	Oil	Dist.	Gas	Oil	Dist.	Gas	Jan., 1954	Jan., 1953	Wild-cats	New Pays	Out-posts	Jan., 1954	Jan., 1953	Jan., 1954	Jan., 1953
Alabama	..	..	..	..	..	..	..	..	..	..	..	3	..	..	3	7	3	7
Arizona	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	2
Arkansas	..	..	..	1	..	..	..	..	..	1	5	6	..	..	6	13	7	18
California	3	..	2	1	..	1	1	..	..	8	5	25	..	..	25	41	33	46
Colorado	3	..	2	..	..	..	..	..	..	5	1	49	..	..	49	28	54	29
Florida	..	..	..	..	..	..	..	..	..	..	..	4	..	..	4	1	4	1
Georgia	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	1	..
Illinois	4	..	..	6	..	..	10	..	..	20	6	69	..	..	69	39	89	45
Indiana	1	..	..	..	..	..	..	..	..	1	2	18	..	..	18	27	19	29
Kansas	10	..	2	..	..	..	..	..	1	13	20	58	..	..	58	73	71	93
Kentucky	3	..	..	..	..	..	..	..	..	3	4	8	..	..	8	6	11	10
Louisiana	4	3	2	6	3	2	..	..	..	20	10	37	..	..	37	46	57	50
North Louisiana	..	..	..	2	..	2	..	..	..	4	..	9	..	..	9	22	13	22
South Louisiana	4	3	2	4	3	..	..	..	..	16	10	28	..	..	28	18	44	28
Michigan	1	..	..	..	..	..	..	..	..	1	4	28	..	..	28	20	29	24
Mississippi	..	..	..	..	..	..	..	..	..	..	5	7	..	..	7	17	7	22
Missouri	..	..	..	..	..	..	..	..	..	..	..	3	..	..	3	1	3	1
Montana	..	..	..	1	..	..	..	..	..	1	1	12	..	..	12	4	13	5
Nebraska	4	..	..	1	..	..	1	..	..	6	..	8	..	..	8	19	14	19
New Mexico	..	..	3	..	1	..	..	..	..	4	4	18	..	..	18	15	22	19
North Dakota	..	..	..	..	..	..	1	..	..	1	..	8	..	..	8	5	9	5
Ohio	..	..	..	..	..	..	..	..	1	1	..	1	..	..	1	2	2	2
Oklahoma	10	1	3	4	..	..	5	..	2	25	24	63	..	..	63	62	88	86
South Dakota	..	..	..	..	..	..	..	..	..	..	..	2	..	..	2	..	2	..
Texas	62	6	10	20	5	1	9	1	2	116	101	350	..	1	351	390	467	491
Dist. 1 South Central	4	..	..	..	..	..	..	..	1	5	3	15	..	..	15	29	20	32
Dist. 2 Middle Gulf	..	1	1	1	..	..	..	..	..	3	4	18	..	..	18	29	21	33
Dist. 3 Upper Gulf	4	1	..	9	2	..	..	..	..	16	14	31	..	..	31	36	47	50
Dist. 4 L. Gulf-S.W.	2	3	..	5	3	1	..	1	..	15	18	26	..	..	26	54	41	72
Dist. 5 E. Central	..	..	..	..	..	..	1	..	..	1	..	5	..	..	5	14	6	14
Dist. 6 Northeast	..	..	..	..	..	..	..	..	..	..	2	12	..	..	12	15	12	17
Dist. 7-B N. Central	24	..	5	..	..	..	1	..	..	30	28	98	..	..	98	94	128	122
Dist. 7-C W. Central	5	..	3	1	..	..	1	..	..	10	6	46	..	..	46	33	56	39
Dist. 8 West	6	..	..	3	..	..	5	..	..	14	16	47	..	..	47	27	61	43
Dist. 9 North	17	..	..	1	..	..	1	..	1	20	10	47	..	1	48	59	68	69
Dist. 10 Panhandle	..	1	1	..	..	..	..	..	..	2	..	5	..	..	5	..	7	..
Utah	1	..	1	..	..	..	..	..	..	2	1	1	..	..	1	3	3	4
Wyoming	6	..	1	1	..	..	1	..	..	9	..	18	..	..	1	12	27	12
Total U. S.	112	10	26	41	9	4	28	1	6	237	193	797	..	1	798	827	1,035	1,020

Exploration Starts Year at High Level

By CECIL W. SMITH, WORLD OIL Staff

THE NEW EXPLORATORY drilling campaign got off to a very good start in January with a record number of tests being completed. A total of 1035 exploratory tests were recorded as complete during the month and that was a new high for the initial month. A year earlier, wells had numbered 1020 for the first time in history, and that had been the first time 1000 exploratory wells had been completed in the month of January. The month's wells also topped the 1017 completed in December.

January's wells were not only numerous, but were above average in dry hole-to-producer ratio. Out of the month's tests, 237 were rated as commercial producers and they amounted to 22.9 percent of the total. In January of last year, 193 successful wells amounted to only 18.9 percent of the total drilled. In 1953, the average amounted to 19.8 percent for the entire year.

January's drilling efforts paid off in the form of 202 new discoveries of oil, distillate, or gas and 35 major extensions to established fields. A total of 153 new oil pools were opened, and they were comprised of 112 new fields and 41 new pay horizons in existing fields. A year ago, 131 new oil pools were credited to the initial month's exploration.

Distillate pools discovered during the month numbered 19, ten new fields and nine new pays. A year ago the count had been 16 new distillate pools. Gas discoveries numbered 30, with new fields totaling 26 and new pays making up the balance. Last year, only 17 new distillate pools were uncovered.

Summary of Results of Exploratory Drilling

ITEM	Jan., 1954	Dec., 1953	Jan., 1953	% Diff. Jan. '53-'54
Oil Discoveries	**153**	**152**	**131**	**+ 16.8**
New Fields	112	120	100	+ 12.0
New Pays	41	32	31	+ 32.3
Distillate Discoveries	**19**	**14**	**16**	**+ 18.8**
New Fields	10	10	11	— 9.1
New Pays	9	4	5	+ 80.0
Gas Discoveries	**30**	**35**	**17**	**+ 76.5**
New Fields	26	31	15	+ 73.3
New Pays	4	4	2	+100.0
Total Discoveries	**202**	**201**	**164**	**+ 23.2**
Extensions to Fields	**35**	**31**	**29**	**+ 20.7**
Oil Fields	28	25	26	+ 7.7
Distillate Fields	1	2	1	....
Gas Fields	6	7	2	+200.0
Total Production Tests	**237**	**235**	**193**	**+ 22.8**
Dry Holes	**798**	**782**	**827**	**— 3.5**
Wildcats	797	779	815	— 2.2
New Pays	....	....	....	....
Outposts	1	3	12	— 91.7
Total Exploratory Tests	**1,035**	**1,012**	**1,020**	**+ 1.5**
Percent Productive	22.9	23.1	18.9	....
Percent Dry	77.1	76.9	81.1	....

U. S. Discoveries in January

NEW FIELDS, NEW PAYS AND EXTENSIONS

ARKANSAS—NEW OIL PAY

Nevada County, Falcon field. Atkins & Pannell's Russell D-1, C NW NW SW 8-15s-22w, pumped 40 barrels oil and 40 water from Blossom sand, Upper Cretaceous 2362-68 feet, 19-gravity, completed 1-4-54, TD 2380.

CALIFORNIA—NEW OIL FIELDS

Kern County, Mount Poso area. Intex Oil Co.'s Gill 2, NW NE 24-26s-27e, flowed 19 barrels oil and 150 water from Vedder sand, Miocene 2133-67 feet, 14.8-gravity, completed 1-25-54, TD 2167.

Los Angeles County, Elizabeth Lake Canyon area. Standard Oil Co.'s Lyons 1, SE NE 7-5n-16w, pumped 4 barrels from 1549-1685 feet, 41-gravity, completed 1-16-54, TD 2172.

La Mirada field. Tide Water Associated Oil Co. and Sterling & Trousdale's McNally 1-36, in 22-3s-11w, flowed 88 barrels from 11,878-958 feet, 8/64-inch, completed 1-14-54, TD, 12,229.

CALIFORNIA—NEW OIL PAY

Kern County, Edison, South field. Presley, Wattenbarger & Cook's PWC 1, NE SW 26-30s-29e, flowed 55 barrels from Schist 3169-3299 feet, 7/64-inch, 27-gravity, completed 1-5-54, TD 3300.

CALIFORNIA—OIL FIELD EXTENSION

Fresno County, Guijarral Hills field. Union Oil's Spieler 27-26, SW SW 26-20s-16e, ½-mile northeast extension, flowed 1241 barrels from Leda sand, Lower Miocene 8810-32 and 8838-52 feet, 35/64-inch, 37.1-gravity, completed 1-24-54, TD 9027

CALIFORNIA—NEW GAS FIELDS

Kern County. Union Oil's Hancock 36-7, NE SW 7-30s-21e, flowed 2.1 million from Phacoides sand, Pliocene 1326-1420 feet, ½-inch, completed 1-15-54, TD 2155.

San Benito County, Lomerias Ranch field. Balken & Krug's Ferry-Morse 1, in 20-12s-5e, flowed 1.0 million from 2410-33 feet, 16/64-inch, completed 12-27-52, TD 2470.

CALIFORNIA—NEW GAS PAY

Glenn County, Beehive Bend field. General Petroleum's McGowan 1, in 25-19n-2w, flowed 2.3 million from McGowan sand 4945-60 feet, 21/64-inch, completed 1-3-54, TD 5257.

COLORADO—NEW OIL FIELDS

Morgan County, Sand River field. Kimbark Co.'s Queen 1, C SW NW 26-1n-56w, pumped 60 barrels from "D" sand, Upper Cretaceous 5144-56 feet, completed 1-20-54, TD 5350.

Unnamed field. Creslenn Oil Co.'s State 1, SE SE SE 16-1n-56w, pumped 60 barrels from "D" sand, Upper Cretaceous 5100-06 feet, completed 1-4-54, TD 5363.

Unnamed field. S. D. Johnson's Howard Glenn 1, SE SE NW 32-2n-57w, flowed 995 barrels from "J" sand, Upper Cretaceous 5525-35 feet, ¾-inch, completed 1-17-54, TD 5570.

COLORADO—NEW GAS FIELDS

Moffat County, Sugar Loaf field. Mountain Fuel Supply's Gov't 2, SW SW 4-11n-101w, flowed 7.1 million from Mesaverde sand, Upper Cretaceous 5018-61 and 5112-68 feet, completed 12-23-53, TD 5434.

Morgan County. Trimark Oil Co.'s Glen Ranches 1, SW SW SE 5-1n-57w, flowed 40.0 million from "J" sand, Upper Cretaceous 5528-38 feet, completed 1-26-54, TD 5570.

ILLINOIS—NEW OIL FIELDS

Clinton County, New Memphis, North field. Collins Bros.' Billhartz 1, SW SW NE 21-1n-5w, Old Well Worked Over, pumped 36 barrels from Devonian lime, 2061-73 and 2075-81 feet, completed 1-19-54, TD 2272.

Posey, West field. R. H. Robben's Ward 1, NE NE NW 12-1n-3w, pumped 7 barrels oil and 25 water from Devonian lime, 2586-2600 feet, completed 1-5-54, TD 2600.

Crawford County, New Hebron, East field. C. W. & J. E. Kendall's S. Crowzier 1, SW SW SE 13-6n-12w, pumped 5 barrels oil and 1 water from Aux Vases sand, Mississippian 1556-60 feet, completed 2-2-54, TD 1571.

Richland County, Schnell, East field. M. V. Ring's Taylor Hrs. 1, SE NE NE 4-2n-9e, pumped 12 barrels oil and 40 water from McClosky lime, Mississippian 3112-18 feet, completed 1-26-54, TD 3150.

ILLINOIS—NEW OIL PAYS

Crawford County, New Hebron field. G. H. Wickham's Coen 1, NW NW SW 27-6n-12w, pumped 20 barrels oil and 5 water from Rosiclare lime, Mississippian 1614-17 feet, completed 2-2-54, TD 1647.

Gallatin County, Ab Lake, West field. Lewis & Clemens' C. Drone 1, NW SE SW 30-8s-10e, pumped 10 barrels from Pennsylvanian sand, 728-732 feet, completed 1-5-54, TD 1020.

Hamilton County, Walpole field. T. M. Pruett's Johnson 1, SW NW SE 22-6s-6e, pumped 101 barrels from Rosiclare sand, Mississippian 3195-3202 feet, completed 1-5-54, TD 3202.

Saline County, Eldorado, East field. G. L. Reasor's E. C. Scott 1, SW NE SE 23-8s-7e, pumped 36 barrels oil and 36 water from Palestine sand, Mississippian 1913-30 feet, completed 1-12-54, TD 1932.

White County, Epworth Consolidated field. J. G. Brown's Hanna 2-B, NE SW 28-5s-10e, pumped 35 barrels oil and 1 water from Pennsylvanian sand, 1319-35 feet, completed 1-5-54, TD 1335.

Storms Consolidated field. Fox and Fox's McCarty Hrs. 2-A, SW NW SW 18-6s-10e, pumped 135 barrels from Degonia sand, 1992-2000 feet and from Clore sand, Mississippian 2036-44 feet, completed 1-5-54, TD 2045.

ILLINOIS—OIL FIELD EXTENSIONS

Clay County, Clay City Consolidated field. G. W. Breuer's E. Sullivan 1, SE SE 8-3n-8e, ½-mile extension, pumped 300 barrels from Cypress sand, Mississippian 2641-56 feet, completed 1-12-54, TD 2660.

Sailor Springs Consolidated field. Coy Oil Co.'s H. W. Heitman et al 1, NE NE NE 1-5n-6e, ½-mile extension, pumped 165 barrels from McClosky lime, Mississippian 2832-38 and 2856-62 feet, completed 1-12-54, TD 2904.

Jasper County, Clay City Consolidated field. Calvert Drilling's Blank-Beucherie 1, NE SW SE 29-6n-10e, ½-mile extension, pumped 21 barrels from McClosky lime, Mississippian 2786-90 feet, completed 1-5-54, TD 2870.

Richland County, Clay City Consolidated field. Don Baines' I. Diel 1, SE NW SE 11-2n-8e, 1-mile extension, pumped 145 barrels from Rosiclare sand, Mississippian 2990-3000 feet, completed 1-26-54, TD 3065.

Saline County, Eldorado, East field. Miami Operating Co.'s W. J. Crawford 1, NW NW NE 24-8s-7e, 1-mile northeast extension, flowed 85 barrels from Aux Vases lime, Mississippian 2900-05 feet, completed 1-26-54, TD 3020.

Wabash County, New Harmony Consolidated field. Norman & Graef's J. B. Donohue 1, NW SW NE 16-1s-13w, ½-mile extension, pumped 40 barrels oil and 1 water from Bethel sand, Mississippian 2590-2606 feet, completed 2-2-54, TD 2608.

Wayne County, Clay City Consolidated field. W. Duncan & Jet Oil's Hollinger 1, SW SE SE 24-1s-7e, ¾-mile extension, pumped 14 barrels from Lower O'Hara lime, Mississippian 3242-51 feet, completed 1-12-54, TD 3345.

Goldengate, North Consolidated field. Howje-Kim's Gregory Hrs. 1, SE NW NE 1-2s-8e, 1-mile west extension, pumped 56 barrels from Rosiclare lime, Mississippian 3310-14 feet, completed 1-12-54, TD 3412.

Goldengate, North Consolidated field. Illinois Midcontinent's Helen Evans 1, NE NE NE 8-2s-9e, ½-mile extension, pumped 44 barrels oil and 40 water from Aux Vases sand, 3231-48 feet and from McClosky lime, Mississippian 3340-43 feet, completed 1-12-54, TD 3439.

White County, Iron Consolidated field. Keystone Oil Co.'s C. W. Mitchell 1, SE NE SW 35-6s-8e, ½-mile extension, flowed 120 barrels from Aux Vases sand, Mississippian 2965-77 feet, completed 1-5-54, TD 2998.

INDIANA—NEW OIL FIELD

Sullivan County. T. & H. Oil Corp.'s Carl & Maurine Medsker 1, NW NW SE 24-8n-11w, pumped 40 barrels from Salem lime, Mississippian 1754-60 feet, TD 2815.

KANSAS—NEW OIL FIELDS

Barton County, Moses field. Petroleum Inc.'s Moses 1, NW NE SW 13-20s-14w, pumped 35 barrels from Lansing lime, Pennsylvanian 3322-34 feet, TD 3550.

Finney County, Finnup, East field. W. L. Hartman's Holsted-Thomason 1, SW SW SW 25-22s-33w, pumped 232 barrels from Marmaton sand, Pennsylvanian 4442-50 feet, TD 4905.

McPherson County. Octace LeBlanc's Unruh 1, SW SW SW 21-19s-2w, pumped 158 barrels from Mississippi lime, 2945-50 feet, TD 2950.

Phillips County. Mont-Sol field. Sohio's Krause 1, SE SE SE 1-4s-19w, pumped 408 barrels from Lansing-K. C. lime, Pennsylvanian 3255-65 feet, TD 3621.

Pratt County, Cairo, North field. G-M-R Oil Co.'s Bucklin 1-A, SE SE NE 6-28s-11w, pumped 195 barrels from Viola lime, Ordovician 4314-18 feet, TD 4508.

Rooks County, Allphin, Northwest field. Heathman-Seeligson et al's H. L. Wait 1, NW NW NE 32-10s-20w, pumped 232 barrels from Arbuckle lime, Ordovician 3738-40 feet, TD 3740.

UNIVERSITY OF MICHIGAN LIBRARIES

Unnamed field. K. & E. Drilling Co. & Stableford's Ondrasek 1, SE NE SW 4-10s-19w, pumped 110 barrels from Arbuckle lime, Ordovician 3691-94 feet, TD 3694.

Stafford County, Glen field. Natural G & O Corp.'s Crissman 1, NW SW SE 14-23s-14w, pumped 43 barrels from Lansing-K. C. lime, Pennsylvanian 3650-57 feet, TD 4044.

Oscar, South field. Petroleum Inc.'s Smith "J" 1, SW NE SE 26-22s-14w, pumped 301 barrels from Arbuckle lime, Ordovician 3817-19 feet, TD 3865.

Sumner County, Bitter Creek field. Alpine Oil & Royalty's Ramp 1, SW SW SW 1-35s-1e, pumped 334 barrels from Mississippi lime, 3500-15 feet, TD 3515.

KANSAS—NEW GAS FIELDS

Morton County, Dryer field. Colorado O & G and Superior's Dryer B-1, NE NE SE 5-32s-43w, flowed 4.5 million from Topeka sand, Pennsylvanian 2966-3244 feet, TD 3555.

Rush County. Tatlock Oil Co.'s Peterson 1, SW SW SE 36-19s-16w, flowed 0.3 million from Arbuckle lime, Ordovician 3647-51 feet, open, TD 3753.

KANSAS—GAS FIELD EXTENSION

Finney County, Hugoton field. The Texas Co.'s Kisner 1, SW NE NE 13-22s-33w, flowed 8.4 million from Chase sand, Permian 2580-2670 feet, TD 4952.

KENTUCKY—NEW OIL FIELDS

Henderson County. George A. Hoffman's Hulbert Hallmark 1, in 2-0-26, pumped 15 barrels from Point Creek sand, Mississippian 1951-57 feet, TD 2326.

Unnamed field. George A. Hoffman's Powell-Minton 1, in 2-N-22, pumped 26 barrels oil and 5 water from Pennsylvanian sand 1011-29 feet, TD 1033.

Todd County. Lewis & Clemens' D. K. Hurt 1, in 3-C-39, pumped 20 barrels from 1268-75 feet, TD 1310.

SOUTH LOUISIANA—NEW OIL FIELDS

Acadia Parish. Southern Minerals' J. Frey 1, in 24-7s-1w, pumped 20 barrels from 4203½-08½ feet, 23-gravity, completed 12-28-53, TD 9698.

Plaquemines Parish, Main Pass area. The California Co.'s Louisiana State 2410-1, Block 24, flowed 178 barrels from 8262-68 feet, 8/64-inch, 35.5-gravity, completed 12-30-53, TD 9022.

St. Bernard Parish, Chandaleur Sound area. Phillips' State Lease 2220-1, Block 48, Elio Bay, flowed 190 barrels from 5856-82 feet, 7/64-inch, 28.5-gravity, completed 1-1-54, TD 9693.

St. Charles Parish, St. Rose field. California's J. B. Levert Land Co. 1, in 27-13s-21e, pumped 100 barrels from Miocene sand, 10,924-940 feet, 36.5-gravity, completed 1-6-54, TD 11,382.

SOUTH LOUISIANA—NEW OIL PAYS

Cameron Parish, Cameron Meadows field. Burton Sutton, Inc.' School Board 31, in 16-14s-13w, flowed 300 barrels from Upper Miocene sand 5412-22 feet, 10/64-inch, 37-gravity, completed 1-29-54, TD 9481.

Iberville Parish, Bayou Des Glaise field. Humble's Wilbert Mineral Corp. 17-B, in 78-8s-8e, flowed 141 barrels from 11,542-566 feet, 8/64-inch, 33.6-gravity, completed 1-29-54, TD 11,707.

Plaquemines Parish, Romere Pass field. California's Romere Pass Unit 79, in 28-20s-19e, flowed 62 barrels from 11,654-658 feet, 9/64-inch, 35.2-gravity, completed 1-19-54, TD 11,805.

St. Martin Parish, Bayou Boullion field. Monterey Exploration Co.'s State Lease 2024-1, in 13-9s-8e, pumped 16 barrels from 2214-26 feet, completed 1-5-54, TD 3609.

SOUTH LOUISIANA—NEW DISTILLATE FIELDS

Acadia Parish. Hassie Hunt, Tr.'s Grant D. Hayes 1, in 34-8s-1w, flowed 25 barrels distillate and 4.5 million from 11,257-267 feet, 11/64-inch, 51.5-gravity, completed 1-3-54, TD 11,296.

Beauregard Parish. Vincent & Welch's W. E. Walker 1, in 24-5s-7w, flowed 9 barrels distillate and 4.4 million from 5008-09 feet, 9/64-inch, 24.8-gravity, completed 12-30-53, TD 9200.

Vermillion Parish. Amerada's Clothil Landry 1, in 24-11s-1e, flowed 75 barrels distillate and 2.9 million from 10,758-775 feet, 3/16-inch, 50-gravity, completed 1-26-54, TD 11,201.

SOUTH LOUISIANA—NEW DISTILLATE PAYS

Acadia Parish, Church Point field. Pan American's E. E. Daigle 1, in 78-8s-2e, flowed 149 barrels distillate and 3.5 million from 10,950-954 feet, 16/64-inch, 48.2-gravity, completed 1-18-54, TD 11,070.

Cameron Parish, Pecan Lake, South field. Pan American's Miami Corp. 12, in 5-15s-4w, northwest extension, flowed 25 barrels distillate and 2.4 million from B-2 sand, Miocene 8550-62 feet, 12/64-inch, completed 1-16-54, TD 12,765.

St. Landry Parish, Krotz Springs field. The Texas Co.'s State-Dr. Don W. Deal Unit 1-1, in 6-7s-7e, flowed 330 barrels distillate and 3.1 million from 8198-8200 feet, 16/64-inch, 53.4-gravity, completed 1-15-54, TD 11,610.

SOUTH LOUISIANA—NEW GAS FIELDS

St. Martin Parish. Texas Crude Oil Co.'s Antoine Frederick 1, in 38-8s-5e, flowed 2.0 milion from 10,346-371, 8/64-inch, completed 1-4-54, TD 10,535.

St. Mary Parish. The Texas Co.'s Miami Corp. 2, in 8-17s-12e, ungauged, completed 1-28-53, TD 13,700.

NORTH LOUISIANA—NEW OIL PAYS

Concordia Parish, Esperance Point field. Jett Drilling Co.'s A. H. Campbell 1, in 7-5n-9e, flowed 105 barrels from Barksdale (Wilcox) sand, Eocene 6553-54 and 6558-60 feet, 7/64-inch, 46.5-gravity, completed 1-30-54, TD 7002.

Webster Parish, Sibley field. Atlantic's Stella M. Roberts 1, C NE SE NW 34-18n-9w, flowed 103 barrels from Upper Glen Rose sand, Lower Cretaceous 4780-87 feet, completed 1-2-54, TD 7150.

NORTH LOUISIANA—NEW GAS PAYS

Caddo Parish, Longwood field. Joe Burnham's A. Z. Gardner 2, in 17-19n-16w, flowed 0.3 million from Nacatoch sand, Upper Cretaceous 860-67 feet, ¼-inch, completed 1-5-54, TD 867.

Longwood field. Smackover Production Co.'s M. R. Mitchell 1, in 6-18n-16w, flowed 1.0 million from Goodland sand, Lower Cretaceous 2383-2400 feet, completed 1-15-54, TD 2400.

MICHIGAN—NEW OIL FIELD

Clare County, Skeels field. Don Rayburn's Roemelen et al 1, S½ SE NE 25-20n-3w, Franklin Township, flowed 600 barrels from Dundee lime, Devonian, 3871-89 feet, TD 3889.

MONTANA—NEW OIL PAY

Dawson County, Woodrow field. The Texas Co.'s J. M. Elpell 1, SW NE 6-16n-54e, pumped 72 barrels oil and 9 water from Ordovician 9998-10,052 feet, completed 1-12-54, TD 10,370.

NEBRASKA—NEW OIL FIELDS

Cheyenne County. Ohio Oil's Engelland 1, SE NW SE 33-15n-49w, pumped 250 barrels from "D" sand, Upper Cretaceous 4580-88 feet, completed 12-21-53, TD 4755.

Kimball County, Long, Northeast field. Eddie Fisher & Balderson-Denver Drilling Co.'s Harris 1, SW SE NW 11-12n-55w, flowed 410 barrels from "J" sand, Upper Cretaceous 6262-65 feet, completed 1-16-54, TD 6272.

Unnamed field. Harry Royster's Harley Long 1, NE NW SW 25-13n-55w, pumped 150 barrels from "J" sand, Upper Cretaceous, completed 1-3-54, TD 6331.

Unnamed field. Rogers Oil Co.'s Markley 2, SW SW SW 35-14n-56w, pumped 65 barrels from "D" sand, Upper Cretaceous 6401-13 feet, completed 12-10-53, TD 6565.

NEBRASKA—NEW OIL PAY

Kimball County, Long field. Stanley P. Keispert's Dorald Long 1, NW NW SE 10-12n-55w, flowed 185 barrels from "D" sand, Upper Cretaceous 6124-44 feet, 13/32-inch, completed 1-6-54, TD 6311.

NEBRASKA—OIL FIELD EXTENSION

Cheyenne County, Doran Farms field. Ohio's Hatcher 1, NE SE NW 33-14n-50w, pumped 82 barrels from "D" sand, Upper Cretaceous 4621-35 feet, completed 1-10-54, TD 4859.

NEW MEXICO—NEW DISTILLATE PAY

Eddy County, Fren field. Skelly's Lynch-Federal A-6, in 22-17s-31e, flowed 196 barrels of distillate and 4.1 million from Pennsylvanian sand, 11,962-982 feet, 51-gravity, completed 1-15-54, TD 13,196.

NEW MEXICO—NEW GAS FIELDS

Rio Arriba County. El Paso Natural's San Juan 27-4 Unit 3, SE NW NE 15-27n-4w, flowed 0.6 million from Mesaverde sand, Upper Cretaceous 5469-5999 feet, completed 1-15-54, TD 6127.

Unnamed field. El Paso's San Juan 30-4-5, SE NW SW 9-30n-4w, flowed 0.1 million from Fruitland sand, Upper Cretaceous 4233-85 feet, completed 1-6-54, TD 4315.

Unnamed field. Phillips' Dakota San Juan 30-5 Unit 6-19, SW SW 19-30n-5w, flowed 0.2 million from Mesaverde sand, Upper Cretaceous 5206-5380 feet, completed 12-30-53, TD 7976.

NORTH DAKOTA—OIL FIELD EXTENSION

Williams County, Hofflund field. Amerada's Margaret Ward Zok et al Unit 1, C NW NW 22-154n-95w, 1½-mile southwest extension, flowed 424 barrels oil and 13 water from Madison lime, Mississippian 8259-95 and 8312-48 feet, 24/64-inch, 44-gravity, completed 12-28-53, TD 8353.

OHIO—GAS FIELD EXTENSION

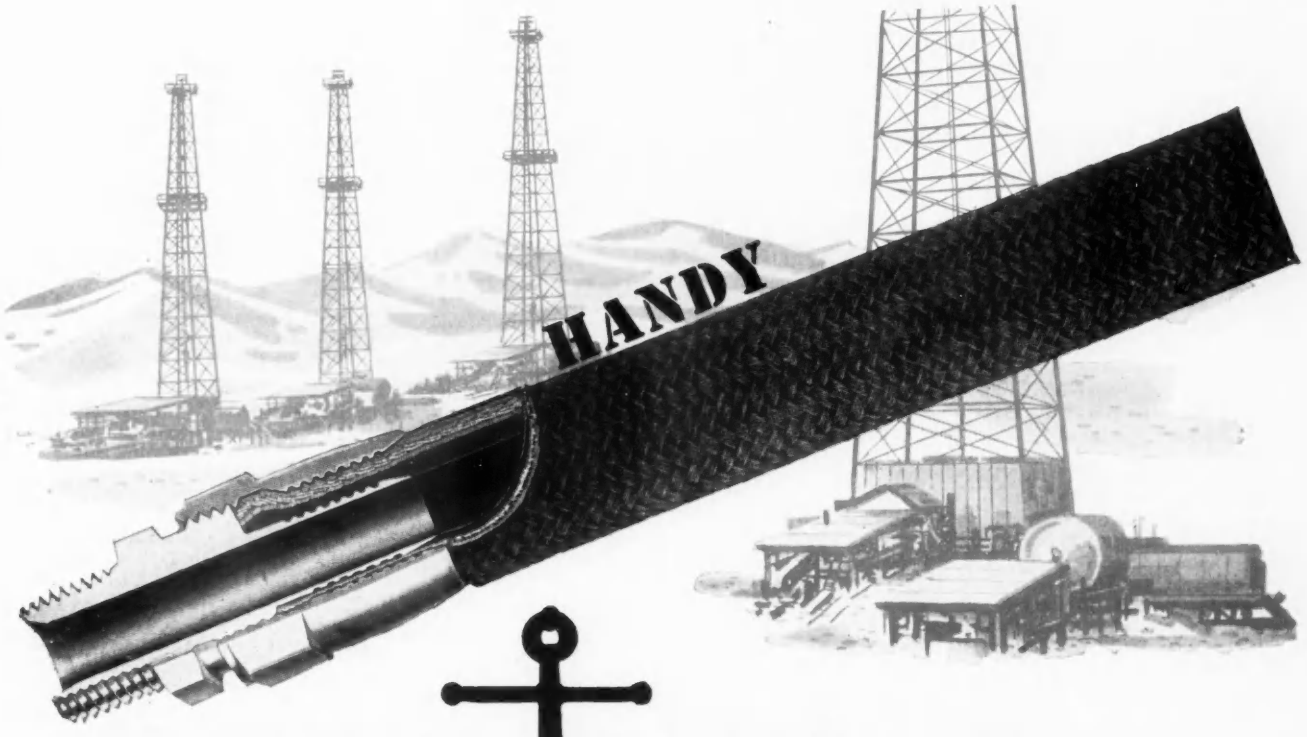
Coshocton County, Mt. Vernon field. Willard Shrider et al's A. J. McConnell 2, Section 6, Jefferson Township, flowed 0.7 million from Clinton sand, Silurian 3417-47 feet, completed 1-2-54, TD 3447.

OKLAHOMA—NEW OIL FIELDS

Creek County. Elmer Laird's Townsend 1, NW SE SE 36-17n-7e, Old Well Worked Over, pumped 18 barrels oil and 50 water from 1st Wilcox sand, Ordovician 3588-3601 feet, TD 3613.

Garfield County. George J. Greer, Tr. & San Juan Drilling's Ruth L. Hammer 1, NE NW NE 2-20n-5w, flowed 210 barrels from Misener sand, Mississippian 6646-60 feet, 6/64-inch, 43-gravity, TD 6949.

Garvin County. Sun's W. E. Caldwell 1, SW SE NE 4-4n-2e, flowed 360 barrels from Burns sand, Pennsylvanian 3400-20



ANCHOR

REUSABLE COUPLING FOR TYPE QW HOSE

for original equipment and *fast field-repair*
— medium- and low-pressure service

Prevents leaks and blow-offs—exclusive patented grip gives extra safety, extra dependability, long life under severe service conditions.

Expensive downtime eliminated—repairs made immediately on the job without special tools.

Easy to assemble—vise, oilcan, and wrench are the only tools needed to assemble couplings and hose.

Reduces hose assembly inventory—carry one coil in hose sizes you use, and cut to lengths you need when you need them.

Can be used over and over.

Ample flow capacity.

NEW!
REVOLUTIONARY
ANCHOR FLANCO
SPLIT-FLANGE CLAMP
Positive leakproof connection *without* threaded joints. Bolt centers are located to distribute the forces evenly and prevent tilting of the clamp halves. Easy to assemble with small automotive-type wrench.

Find out how Anchor reusable couplings for type QW hose save time, trouble, money. Attach coupon to your letterhead and mail today.

ANCHOR COUPLING CO. INC.

Main Office and Factory: LIBERTYVILLE, ILLINOIS

FACTORY BRANCHES: DETROIT, MICHIGAN • DALLAS, TEXAS

Anchor Coupling Co. Inc.
Dept. W034, Libertyville, Illinois
I'd like to know more about
☐ Anchor Ductile-Sleeve Hose Assemblies
☐ New Anchor Flanco Split-flange clamp-type coupling
Send me more information.

Name..... Title.....

Company Name.....

Company Address.....

City..... ( ) State.....

UNIVERSITY OF MICHIGAN LIBRARIES

feet, 13/64-inch, 41-gravity, TD 4697.

Kay County. L. C. Smitherman's Means 1, SW SW NW 30-29n-3e, pumped 19 barrels oil and 300 water from Bartlesville sand, Pennsylvanian 3289-94 feet, TD 3303.

Lincoln County. Davidor & Davidor's Neill 1, SE SE NE 16-15n-3e, flowed 550 barrels from Lower Skinner sand, Pennsylvanian 4253-59 feet, 6/64-inch, 37-gravity, TD 5131.

Noble County. Kewanee Oil's Stanislav 1, NW SW NW 6-20n-1e, pumped 74 barrels oil and 9 water from Layton sand, Pennsylvanian 4053-66 feet, 38-gravity, TD 5482.

Pawnee County. Fortune Oil's Knox 1, NE SE SE 2-20n-5e, Old Well Worked Over, flowed 25 barrels oil and 72 water from Red Fork sand, Pennsylvanian 3274-90 feet, TD 3330.

Unnamed field. Signal O&G Co.'s Richard T. Endicott 1, NE NE NW 34-23n-5e, flowed 185 barrels from 1st Wilcox sand, Ordovician 3478-98 feet, 15/64-inch, 42-gravity, TD 3578.

Payne County. Texas Pacific C&O Co.'s Josephine L. Story 1, SE NW NW 1-17n-3e, flowed 36 barrels oil and 9 water from Skinner sand, Pennsylvanian 3642-64 feet, 22/64-inch, 27-gravity, TD 4460.

Pontotoc County. Churchill Thomas' Fee 1, NW SE SW 7-3n-6e, pumped 65 barrels from Gilcrease sand, Pennsylvanian 1220-34 feet, TD 1404.

OKLAHOMA—NEW OIL PAYS

Grady County, Bradley, Southeast field. Magnolia's Howell-Gragg 1, C NW SE 14-4n-5w, flowed 325 barrels from Lower Springer sand, Pennsylvanian 9860-9905 feet, 24/64-inch, 40-gravity, TD 14,020.

McClain County, Lindsay, Northwest field. Cities Service's Gill 1, C NW NW 21-5n-4w, flowed 289 barrels from Simpson (Bromide) sand, Ordovician 11,140-326 feet, 12/64-inch, 44.3-gravity, TD 12,128.

Seminole County, Wetley field. Great Western O&G's Martin 1, NE SE NE 23-5n-5e, Old Well Worked Over, pumped 90 barrels oil and 17 water from Hunton lime, Devonian 2535-40 feet, 38-gravity, TD 2685.

Wetley, Northwest field. The Texas Co.'s W. S. Damron B-1, SE NE NW 14-5n-5e, flowed 32 barrels from Mayes sand, Mississippian 2194-2210 feet, 30-gravity, TD 3136.

OKLAHOMA—OIL FIELD EXTENSIONS

Carter County, Sholem Alechem field. Samedan Oil's Camp 1, SW SW SE 9-2s-3w, flowed 126 barrels from Morris sand, Pennsylvanian 5254-84 feet, 20/64-inch, 27-gravity, TD 6500.

Kay County, Dilworth field. Time Petroleum's Parker 1, NE NE SE 33-29n-1e, pumped 33 barrels oil and 30 water from Cleveland sand, Pennsylvanian 3134-48 feet, TD 3300.

Payne County, Paradise, Southeast field. Kingwood Oil's Lesterman 1, SW SE NE 27-18n-1e, pumped 30 barrels oil and 30 water from Bartlesville sand, Pennsylvanian 4735-50 feet, 37-gravity, TD 4768.

Schlegel, North field. Foster Drilling's Sawatzsky 1, NW NW SE 15-18n-6e, pumped 7 barrels from Red Fork sand, Pennsylvanian 2940-60 feet, 38-gravity, TD 2980.

Seminole County, Carr City field. N. B. Hunt's J. C. Hurst 1, NE NW SW 10-8n-5e, flowed 192 barrels from Hunton lime, Devonian 3939-75 feet, 18/64-inch, 39-gravity, TD 4262.

OKLAHOMA—NEW DISTILLATE FIELD

Carter County. Gulf's Riner 1, SW SW SW 32-5s-2e, flowed 10 barrels distillate and 2.6 million from Lake Ardmore sand, Mississippian 4880-4964 feet, 50-gravity, TD 7318.

OKLAHOMA—NEW GAS FIELDS

Lincoln County. Horace E. White's Sarah Tolleson 1, NW SE NW 22-15n-6e, Old Well Worked Over, flowed 6.6 million from Pennsylvanian 1382-1404 feet, TD 4273.

Unnamed field. Jernigan & Morgan Oil Co.'s Gardner 1, SW SW SW 31-15n-2e, Old Well Worked Over, flowed 11.7 million from Checkerboard sand, Pennsylvanian 3904-23 feet, TD 5445.

Texas County. The Texas Co.'s J. H. Cook 1, C SW NE 27-1n-19ecm, flowed 22.3 million from Morrow sand, Pennsylvanian 6812-94 feet, TD 7400.

OKLAHOMA—GAS FIELD EXTENSIONS

Hughes County, Papoose, Southeast field. John R. Warren et al's Carnes 1, SE SW NE 12-9n-9e, flowed 1.9 million from Lower Gilcrease sand, Pennsylvanian 3098-3108 feet, TD 3163.

Texas County, Unnamed field. The Texas Co.'s Winfrey-Brown Unit 1, NE NE SW 15-1n-19ecm, flowed 12.1 million from Morrow sand, Pennsylvanian 6792-6815 feet, TD 7110.

TEXAS DISTRICT 1—NEW OIL FIELDS

Atascosa County. Carter & Carter's Dick Prassel 1, W. W. Robbins Survey, Section 6, flowed 105 barrels from Navarro sand, Upper Cretaceous 4695-4730 feet, 12/64-inch, 39-gravity, completed 1-14-54, TD 4730.

Bexar County. Sutton Drilling's R. F. Pancoast 1, J. M. Arocha Survey, pumped 11 barrels from 1440-62 feet, 33.5-gravity, completed 1-1-54, TD 1462.

Medina County. Carter & Carter's A. L. Haegelin 1, W. E. Henley Survey, Section 116, pumped 5 barrels from 340-371 feet, 19-gravity, completed 1-15-54, TD 371.

Unnamed field. E. L. Kelly's James Bailey 1, H. Castro Survey 367, Old Well Worked Over, pumped 9½ barrels from 837½-881 feet, completed 6-21-53, TD 881.

TEXAS DISTRICT 1—GAS FIELD EXTENSION

McMullen County, Unnamed field. J. R. Butler's Hays Ezzell 5, Section 14, Jerry Scanlan Survey, flowed 26,200 cubic feet from 1201-11 feet, open, completed 1-17-54, TD 1576.

TEXAS DISTRICT 2—NEW OIL PAY

Jackson County, Francitas, North field. J. S. Gissel et al's L. E. Payne 1, Maria de Jesus Leal Survey, flowed 81 barrels from Payne and 8550-58 feet, 7/64-inch, 48-gravity, completed 1-3-54, TD 8897.

TEXAS DISTRICT 2—NEW DISTILLATE FIELD

Calhoun County. Salt Dome & Western Natural's State Tract D-1, flowed 390 barrels distillate and 8.8 million from Basal Miocene sand 6425-50 feet, completed 12-28-53, TD 10,560.

TEXAS DISTRICT 2— NEW GAS FIELD

Jackson County. South Texas O&G Co.'s Vernon & Pearl Laughter 1, Wm. Whitaker Survey, flowed 60.0 million from 3978-80 feet, open, completed 1-11-54, TD 4800.

TEXAS DISTRICT 3—NEW OIL FIELDS

Brazoria County. Fort Bend Oil's Anderson & Peterson 1, S. F. Austin 1¾ League, Block A, flowed 172 barrels from 11,334-340 feet, ⅛-inch, 37.6-gravity, completed 1-18-54, TD 11,550.

Hardin County, "Jimmie Owen" field. J. P. Owen's Carl C. Gore 1, James Rafferty League, flowed 56 barrels from 1st Cockfield sand, Eocene 6402-36 feet, ⅛-inch, 40-gravity, and flowed 149 barrels from 2nd Cockfield sand, Eocene 6532-35 feet, 10/64-inch, 39.7-gravity, completed 1-3-54, TD 7597.

Harris County. Russell Maguire & R&S Oil Co.'s John J. Sweeney Est. 1, in W.C.R.R. Survey, Section 6, Block 2, flowed 90 barrels from 6866-68 feet, 7/64-inch, 40.7-gravity, completed 1-14-54, TD 7626.

Montgomery County. The Moran Corp. & Gar-Flo Oil's Hunt & Floyd 1, John Bricker Survey, flowed 135 barrels from 5128-31 feet, ⅛-inch, 36.2-gravity, completed 1-28-54, TD 8805.

TEXAS DISTRICT 3—NEW OIL PAYS

Brazoria County, Danbury Dome field. Gulf's South Texas Dev. Co. A-1, Henry Austin Survey, flowed 149 barrels from 7757-62 feet, 15/64-inch, 40-gravity, completed 1-15-54, TD 8702.

Rowan, North field. Texas Eastern's North Rowan Unit 2-1, Francis Moore Survey, flowed 62 barrels from 9572-78 feet, ⅛-inch, 43.5-gravity, completed 1-19-54, TD 11,071.

Fort Bend County, Moore's Orchard field. Gulf's J. M. Moore et al 101, in James Frazier Survey, Old Well Worked Over, flowed 62 barrels from 1530-91 feet, 9/64-inch, 23.4-gravity, completed 1-6-54, TD 3900.

Galveston County, Caplen field. Sun's Zinn & Forman 14, C. A. Hughes Survey, flowed 41 barrels from 4128-29 feet, 9/64-inch, 26.7-gravity, completed 1-22-54, TD 7712.

Harris County, Huffsmith (Petrich) field. R. W. Ramey's W. T. Jones et al 6, J. Donnelly Survey, flowed 125 barrels from Kobs No. 2, 5765-67 feet, 8/64-inch, 38.4-gravity, completed 1-19-54, TD 7010.

Humble Light field. I. Rauch, Trustee's H. C. House 18, Mary Owens Survey, flowed 153 barrels from 3881-87 feet, 16/64-inch, 38.4-gravity, and flowed 218 barrels from 4204-10 feet, 14/64-inch, 34.7-gravity, completed 1-26-54, TD 5000.

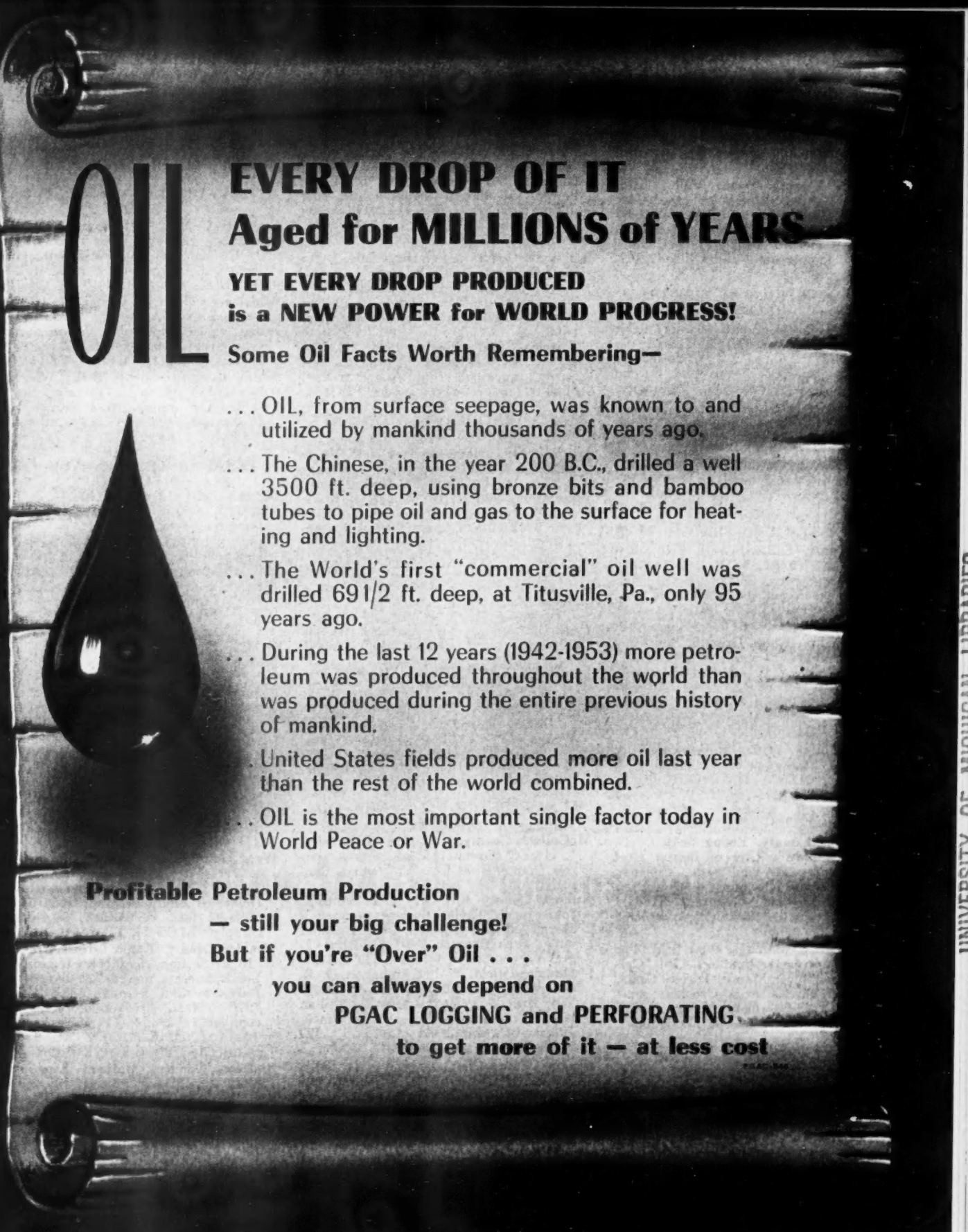
Jasper County, Buna, North field. Ada Oil-Hurt Oil's Hardy Richardson 7, John D. Johnson Survey, flowed 57 barrels from Yegua No. 5 sand, Eocene 7150-56 feet, 7/64-inch, 40.5-gravity, completed 1-29-54, TD 7285.

Jefferson County, Spindletop field. Michel T. Halbouty's Marrs McLean Fee 4, P. Humphries Survey, flowed 102 barrels from Frio 2-A sand, Oligocene 5130-76 feet, 10/64-inch, 34.1-gravity, completed 1-9-54, TD 5741.

Tyler County, Wurtsbaugh field. Shell's Kirby L Tract 168-A-1, Mrs. Sarah Fields Survey, flowed 81 barrels from Wilcox sand, Eocene 9032-43 feet, ⅛-inch, 44-gravity, completed 1-6-54, TD 9207.

TEXAS DISTRICT 3—NEW DISTILLATE FIELD

Tyler County. Shell's Kirby Lbr. Tract 165-A-1, F. Helfenstein Survey, flowed 370 barrels distillate and 23.0 million from Wilcox "L" sand, Eocene 9393-9610 feet, 49.6-gravity, completed 10-26-53, TD 10,502.


OIL
EVERY DROP OF IT
Aged for MILLIONS of YEARS
YET EVERY DROP PRODUCED
is a NEW POWER for WORLD PROGRESS!
Some Oil Facts Worth Remembering—
. . . OIL, from surface seepage, was known to and utilized by mankind thousands of years ago.
. . . The Chinese, in the year 200 B.C., drilled a well 3500 ft. deep, using bronze bits and bamboo tubes to pipe oil and gas to the surface for heating and lighting.
. . . The World's first "commercial" oil well was drilled 69 1/2 ft. deep, at Titusville, Pa., only 95 years ago.
. . . During the last 12 years (1942-1953) more petroleum was produced throughout the world than was produced during the entire previous history of mankind.
. . . United States fields produced more oil last year than the rest of the world combined.
. . . OIL is the most important single factor today in World Peace or War.
Profitable Petroleum Production
— still your big challenge!
But if you're "Over" Oil . . .
you can always depend on
PGAC LOGGING and PERFORATING
to get more of it — at less cost

PGAC PERFORATING GUNS ATLAS CORPORATION
Houston, Texas Telephone: LYnchburg 4161
General Offices: 3915 Tharp St. — Sales Office: Melrose Bldg. — Main Plant: 7730 Scott St.

31 PGAC OFFICES ALWAYS READY TO SERVE YOU . . . CALL THESE TELEPHONE NUMBERS FOR PROMPT SERVICE
EXAS: Houston, LYnchburg 4161 — Corpus Christi, 3-1324 — Dallas, RAndolph 2943 — Longview, Plaza 9-4486 — Alice, 4-5872 or 4-3092 — Mission, 5-1687
Abilene, 2-4172 — Gainesville, 2517 — Odessa, 6-6429 — Beaumont, 2-4263 — Victoria, 1023 — Graham, 1728.
OUISIANA: Shreveport, 3-1648—Lake Charles, 4724—Lafayette, 4-2396. KANSAS: Great Bend, 4306 or 4307. NEW MEXICO: Hobbs, 3-5852
KLAHOMA: Oklahoma City, CEntral 2-5342—Pauls Valley, 1577—Seminole, 2938—Healdton, 77—Ardmore, 857.

AFFILIATE COMPANIES: CANADA—Perforating Guns of Canada, Ltd.; Edmonton, Alberta
GERMANY—Atlas Deutsch-Amerikanische Olfelddienst G. m. b. H.; Kiel

UNIVERSITY OF MICHIGAN LIBRARIES

TEXAS DISTRICT 3—NEW DISTILLATE PAYS

Colorado County, Englehart field. Skelly's Joe Labay 1, Sam Kennelly Survey, ½-mile east extension, flowed 6 barrels distillate and 1.6 million from 6525-30 feet, 7/32-inch, 51.6-gravity, completed 1-19-54, TD 9235.

Matagorda County, Sugar Valley field. Humble's Anna B. Taylor et al B-4, Freeman George Survey, flowed 67 barrels distillate and 4.7 million from Frio sand, Oligocene 12,099-121 feet, 35.1-gravity, completed 12-28-53, TD 12,359.

TEXAS DISTRICT 4—NEW OIL FIELDS

Jim Hogg County, "South Manila" field. George H. Coates' W. A. Danelly 1, CB&CNG RR Survey 154, flowed 29 barrels from Upper Pettus sand, Eocene 2554-59 feet, 12/64-inch, 30-gravity, completed 1-1-54, TD 2561.

San Patricio County, Meehan field. Jake L. Hamon et al's Thomas C. Meehan 1, Toribio Molina Survey, Block 18, flowed 19 barrels from 5330-35 feet, 3/64-inch, 47-6-gravity, completed 1-11-54, TD 6515.

TEXAS DISTRICT 4—NEW OIL PAYS

Duval County, Saliseo Creek field. The Texas Co.'s DCRC NCT-12 2-A, GB&CNG RR Survey, Section 61, pumped 30 barrels oil and 44 water from Frio sand, Oligocene 1328-38 feet, 21.2-gravity, completed 1-3-54, TD 1508.

Nueces County, Clara Driscoll, Southeast field. Southern Minerals & Magnolia's H. A. Johnson 2, G. H. Paul Sbdn Driscoll Ranch, Section 125, flowed 14 barrels from Frio sand, Oligocene 5157-71 feet, ⅛-inch, 38.8-gravity, completed 1-10-54, TD 6709.

Nueces County, East Robstown field. Arnold O. Morgan's H. C. Wood 1-28, Geo. H. Paul Sbdn "D," Driscoll Ranch, flowed 154 barrels from Wood sand 5555-60 feet, 9/64-inch, 42-gravity, completed 1-25-54, TD 5773.

San Patricia County, Ewing field. C. G. Glasscock et al's City of Sinton Unit 29-1, George H. Paul Sbdn, Coleman Fulton Pasture Co., flowed 45 barrels from Sinton sand, Oligocene 5468-71 feet, 11/28-inch, 34.8-gravity, completed 1-28-54, TD 6028.

Zapata County, Jennings, West field. The Texas Co.'s J. D. Jennings 170, "Cerrito Blanco" Jose Manuel Pareda Grant, flowed 5 barrels from Crockett sand, Eocene 3282-98 feet, ⅛-inch, 41.3-gravity, completed 1-1-54, TD 3450.

TEXAS DISTRICT 4—NEW DISTILLATE FIELDS

Hidalgo County, Bloomberg field. Sun's Beatrice L. Murch 1, Porcion 41, flowed 30 barrels distillate and 1.9 million from Vicksburg sand, Oligocene 5986½-6009 feet, 53-gravity, completed 1-18-54, TD 7002.

Monte Christo, North field. Superior's John Hamman B-1, San Salvador Del Tule Grant, Melado Tract, Jackson Sbdn, Block 264, flowed 10 barrels distillate and 1.5 million from 8326-36 feet, open, 52-gravity, completed 1-23-54, TD 10,440.

Nueces County, Cayo Del Oso, North field. Selby-Walker Corp.'s Ennis S. Joslin 1, Flour Bluff & Encinal Farm & Garden Tracts, Section 28, Lot 8, flowed 238 barrels distillate and 22.5 million from Frio "O-1" sand, Oligocene 6631½-39½ feet, open, 47.5-gravity, completed 1-7-54, TD 6810.

TEXAS DISTRICT 4—NEW DISTILLATE PAYS

Hidalgo County, Lacy field. Hydrocarbon Prod. Co.'s Crain & Griffith 1, in North Capisallo Survey, Lot 2284, Block 47, flowed 150 barrels distillate and 10.0 million from Frio "R" sand, Oligocene 7503-11 feet, 16/64-inch, 47.9-gravity, completed 1-5-54, TD 8021.

Jim Wells County, Alice-Deep field. Delta Gulf Drilling's Josefa Kalineo 1, in "La Vaca" Jose Maria Garcia Grant, flowed 20 barrels distillate and 13.5 million from 7605-20 and 7705-25 feet, open, 8408.

Tijerina-Canales-Blucher field. La Gloria's C. H. F. Blucher 33, Mrs. L. Best Survey, ungauged from Augustus sand 6668-80 feet, completed 1-7-54, TD 7631.

TEXAS DISTRICT 4—DISTILLATE FIELD EXTENSION

San Patricio County, Spartan field. Spartan Drilling's Callie Hightower 1, Welder & Odem Sbdn, Block 34, ¾-mile south extension, flowed 615 barrels distillate and 13.5 million from Frio sand, Oligocene 8742-50 feet, open, 50-gravity, completed 1-16-54, TD 9000.

TEXAS DISTRICT 4—NEW GAS PAY

Jim Wells County, Presenos field. Pontiac Refining's J .H. Misenheimer 1-A, Los Presenos De Abajo Survey, flowed 15.7 million from Heterostegina sand 2981-97 feet, open, completed 1-6-54, TD 5600.

TEXAS DISTRICT 5—OIL FIELD EXTENSION

Navarro County, Corsicana-Powell field. W. E. Stewart's J. A. Jackson 1, R. C. Dooms Survey, east extension, pumped 18 barrels from Nacatoch sand, Upper Cretaceous 682-1825 feet, 23.2-gravity, completed 1-22-54, TD 1825.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

McCulloch County. J. C. Cox's P. L. West 1, H&TC Survey 155, pumped 26 barrels from 964-69 feet, 38-gravity, completed 1-12-54, TD 969.

Runnels County. Ray Oil's T. F. Smith 1, John Jacob Taylor Survey, pumped 7 barrels oil and 2 water from Gardner sand, Pennsylvanian 4175-85 feet, 42-gravity, completed 1-16-54, TD 4185.

Unnamed field. Walter Duncan's D. E. Caudle 1, John Brown Survey, Block 528, flowed 71 barrels from McMillan sand, Permian 2601-05 feet, 16/24-inch, 40-gravity, completed 12-19-53, TD 2605.

Sutton County. Sinclair's Nettie D. Steen 1, Section 64, Block A, HE&WT Survey, flowed 93 barrels oil and 31 water from Wolfcamp lime, Permian 4185-4205 feet, 24/64-inch, 37.8-gravity, completed 1-23-54, TD 7030.

Upton County. Hunt Oil's V. T. Amacker 1, Section 106, Block D, CCSD&RGNG Survey, flowed 410 barrels from Ellenburger lime, Ordovician 12,000-127 feet, ¼-inch, 53.5-gravity, completed 12-29-53, TD 12,127.

TEXAS DISTRICT 7-C—NEW OIL PAY

Tom Green County, Pecan Station field. Sinclair's Elizabeth Green 1, Section 7, Block 25, H&TC Survey, flowed 671 barrels from Home Creek lime, 4485-4505 feet, 16/64-inch, 43.7-gravity, completed 12-31-53, TD 5560.

TEXAS DISTRICT 7-C—OIL FIELD EXTENSION

Runnels County, Ballinger field. Pan American's G. Nunn "B" 1, Block 163, ETRR Survey, ½-mile northeast extension, flowed 36 barrels from Serratt sand 2433-2436 feet, ¾-inch, 46-gravity, completed 11-12-53, TD 2452.

TEXAS DISTRICT 7-C—NEW GAS FIELDS

Crockett County. J. I. & P. D. Moore's Shannon Est. 1-P, in Section 11, Block 9, DS&E Survey, flowed 7-8 million from San Andres lime, Permian 1709-14 feet, open, completed 1-15-54, TD 1866.

Schleicher County. Carter & Carter's Sheen Bros. 1-A, Section 6, BS&F Survey, flowed 3.3 million from Strawn sand, Pennsylvanian 4411-17 and 4421-25 feet, completed 1-14-54, TD 4430.

Sutton County. Shell's Duke Wilson 5, Section 39, Block 14, TW&NG Survey, flowed 7.0 million from Strawn sand, Pennsylvanian 4296-4304 feet, completed 12-29-53, TD 4304.

TEXAS DISTRICT 8—NEW OIL FIELDS

Garza County. La Gorce Oil's C. B. Johnston 1, Section 1246, AB&M Survey, pumped 96 barrels from San Andres lime, Permian 3572-80 feet, 38-gravity, completed 1-22-54, TD 3614.

Howard County. Trans-Tex Drilling's Read Ranch 1, Section 22, Block 25, H&TC Survey, flowed 504 barrels from Reef lime, Pennsylvanian 7713-21 feet, 18/64-inch, 47-gravity, completed 1-23-54, TD 7723.

Martin County. Stanolind's C. M. Brown 1, Section 15, Block 34, T-3-N, T&P Survey, pumped 17 barrels oil and 409 water from Pennsylvanian lime 9486-9503 feet, 40-gravity, completed 1-19-54, TD 9562.

Mitchell County, "Dixon" field. Liedtke & Liedtke et al's Ross D. Dixon, Jr. 1, Section 2, Block 1-A, H&TC Survey, flowed 729 barrels from Strawn sand, Pennsylvanian 6200-27 and 6252-69 feet, ½-inch, 41-gravity, completed 1-12-54, TD 6347.

Ward County. Argo Oil Corp.'s Pat Wilson et al 1, in Section 134, Block 34, H&TC Survey, flowed 28 barrels from Delaware sand, Permian 5051-61 and 5084-96 feet, 13/64-inch, 38.4-gravity, completed 1-13-54, TD 5464.

Winkler County. Ralph Lowe's University "E" 1, Section 26, Block 21, University Lands Survey, flowed 223 barrels from Delaware sand, Permian 6387-6405 and 7210-35 feet, 20/64-inch, 38.8-gravity, completed 1-24-54, TD 7505.

TEXAS DISTRICT 8—NEW OIL PAYS

Andrews County, Midland Farms field. Stanolind's David Fasken 5-G, Section 7, Block 42, T-1-N, G&MMB&A Survey, flowed 186 barrels from Wolfcamp lime, Permian 8365-8544 feet, 14/64-inch, 45-gravity, completed 12-27-53, TD 12,565.

Wemac field. Continental's F. T. McCollum & G. W. Weibusch 5, Section 24, Block A-44, PSL Survey, flowed 1320 barrels from Ellenburger lime, Ordovician 13,306-343 feet, 20/64-inch, 50-gravity, completed 1-18-54, TD 13,554.

Gaines County, North Jenkins field. Humble's James B. Riley et al 2, Section 363, Block G, CCSD&RGNG Survey, pumped 109 barrels from Lower Clearfork lime, Permian 7148-7221 feet, 35.9-gravity, completed 1-6-54, TD 9005.

an ACCO product

AMERICAN CABLE

TRU-LAY PREFORMED WIRE ROPE

Wherever You See This Famous Name ... MID-CONTINENT SUPPLY CO.

Have you seen American Cable's *Ton-Mile Book* which makes it easy for you to get every nickel's worth of value built into these long-life TRU-LAY Preformed rotary drilling lines? Ask your Mid-Continent Supply Co. man for a copy. Let him show you how to use it to cut your wire line costs.

American Cable makes, and Mid-Continent stocks, every type of wire rope you need and in a variety of sizes. These pals are your best bet when you need lines. Check with them today.

You can call your nearby Mid-Continent Supply Co. store at any time—24 hours a day— and get the TRU-LAY Preformed line you need from their stock. They have what you need . . . *when YOU need it.*

ACCO

American Cable Division
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

plus ACCO Registered Wire Rope Slings

UNIVERSITY OF MICHIGAN LIBRARIES

Midland County, Pegasus field. Sinclair's June Tippett 17, Section 17, Block 40, T-4-S, T&P Survey, flowed 883 barrels from Glorietta lime, Permian 5584-5610 feet, ½-inch, 29.9-gravity, completed 1-20-54, TD 5615.

TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

Andrews County, University Block 9 field. Skelly's Texas 2-L, Section 11, Block 9, University Lands Survey, flowed 1037 barrels from Wolfcamp lime, Permian 8403-90 feet, 48/64-inch, 40-gravity, completed 1-29-54, TD 8615.

Borden County, Good, Northeast field. The Texas Co.'s A. M. Clayton 8-A, in Section 32, Block 32, T-4-N, T&P Survey, 1½-mile northeast extension, flowed 515 barrels from Canyon Reef lime, Pennsylvanian 8099-8114 feet, 32/64-inch, 45.2-gravity, completed 1-13-54, TD 8127.

Garza County, P. H. D. field. Leonnie Oil's H. N. Crisp 1, Section 1298, GD&WRR Survey, 1-mile east extension, pumped 16 barrels from San Andres lime, Permian, 3514-58 feet, 35.2-gravity, completed 12-27-53, TD 3558.

Howard County, Moore field. Duncan Drilling's Wilkinson 1, Section 33, Block 34, T-1-N, T&P Survey, 2⅜-mile northwest extension, pumped 83 barrels from San Andres lime, Permian, 3186-3235 feet, 32-gravity, completed 1-30-54, TD 3235.

Lamb County, Littlefield field. The Texas Co.'s Ida Dalmont Hewitt 1, State Capitol Lands Survey, ½-mile north extension, pumped 79 barrels oil and 13 water from San Andres lime, Permian 3946-4026 feet, 28-gravity, completed 1-6-54, TD 4026.

TEXAS DISTRICT 10—NEW GAS FIELDS

Hansford County. Humble's East Gruver Gas Unit 1, Section 111, Block 45, H&TC Survey, flowed 23 barrels distillate and 26.5 million from Douglas sand, Permian 4960-80 feet, completed 12-30-53, TD 9118.

Unnamed field. The Texas Co.'s T. J. Blakemore 1, Section 30, Block 4-T, T&NO Survey, flowed 6.9 million from Morrow sand, Pennsylvanian 7298-7308 and 7356-70 feet, completed 1-6-54, TD 10,010.

UTAH—NEW OIL FIELD

Uintah County. Gulf's Brannan Bottom 1, C NE SE 13-7s-20e, pumped 162 barrels from Green River lime, Eocene 6870-7000 feet, 34-gravity, completed 1-28-54, TD 7495.

UTAH—NEW GAS FIELD

Emery County, Clear Creek area. Three States Natural Gas' Colleen K. Steiner 1-A, SW 5-15s-7e, flowed 14.0 million from Ferron sand, Upper Cretaceous, 4341-4825 feet, open, completed 1-10-54, TD 4900.

WYOMING—NEW OIL FIELDS

Big Horn County. Gulf's O. B. Smith 1, SW NE 34-50n-92w, pumped 250 barrels from Phosphoria 6712-80 feet, completed 1-8-54, TD 6780.

Converse County. Union & Brazos O&G Co.'s Powell Unit 1, SE SE SE 29-40n-73w, flowed 40 barrels from Sussex sand 9480-96 and 9501-26 feet, completed 1-19-54, TD 11,684.

Fremont County. Sinclair's Jade Unit 2, NW SW SW 3-28n-93w, flowed 176 barrels from Dakota lime, 4509-36 feet, 16/64-inch, completed 1-20-54, TD 4651.

Niobrara County. R. L. Manning, et al's, Government 1-A, C NW SW 3-40n-77w, flowed 350 barrels from Newcastle lime, Upper Cretaceous 7732-48 feet, 26/64-inch, completed 1-21-54, TD 7926.

Weston County. C. G. Glasscock's Allie Dixon 2, NE NW SW 11-41n-66w, flowed 1152 barrels from Newcastle lime, Upper Cretaceous 7136-53 feet, ½-inch, completed 12-27-53, TD 7208.

Weston County. McCall Drilling's Dixon 1, SW NE NE 23-43n-65w, flowed 273 barrels from Newcastle lime, Upper Cretaceous 5852-58 and 5876-88 feet, completed 12-21-53, TD 5960.

WYOMING—NEW OIL PAY

Fremont County, Beaver Creek field. Stanolind's Unit 30-M, S½ NW NE 10-33n-96w, flowed 250 barrels from Madison lime, Mississippian, 11,185-243 feet, 7/64-inch, 40-gravity, completed 1-5-54, TD 11,447.

WYOMING—OIL FIELD EXTENSION

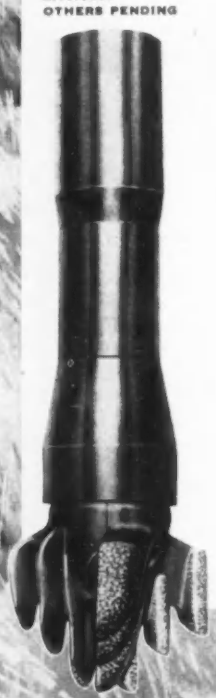
Johnson County, West Sussex field. Walter G. & Mark J. Davis' Gov't 3, NE NW NE 3-42n-80w, northwest extension, flowed 720 barrels from Shannon lime, 2858-2900 feet, completed 1-11-54, TD 2900.

WYOMING—NEW GAS FIELD

Natrona County. Arco Oil-Anschutz Drilling's Lane Creek Gov't. 1, SW NW NW 12-40n-80w, flowed 70.0 million from 2nd Wall Creek sand, Upper Cretaceous 2036-55 feet, completed 1-20-54, TD 2147.

"BLUE DEMON" BITS PICKED FOR MAXIMUM SHOT HOLE EFFICIENCY ON AFRICAN SAFARI . . .

U. S. PATENTS
2,615,684
2,666,622
OTHERS PENDING



SHOT HOLE DRILLERS the world over are finding Hawthorne "Blue Demon" Rock Cutter Bits a sure-shot cost cutter in their exploration drilling.

A well-known geophysical company, fitting out to explore 20,000 square miles of East Africa's rugged thornbush country for a large international oil company, made sure to include an ample stock of "Blue Demons" for fast, efficient footage in the soft and sedimentary formations.

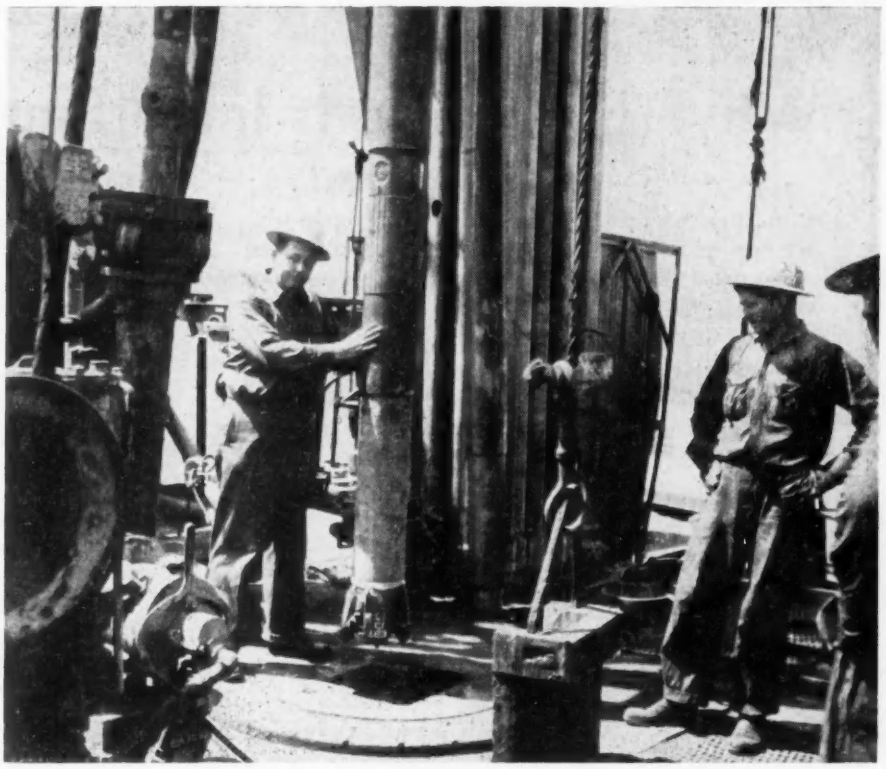
They know that "Blue Demon" Bits, for all-purpose drilling, can produce *more profiles per drill per day*, the year around, than any other bits. "On-the-drill" bit service, with replaceable blades, reduces bit cost per foot too.

Continuing contractor and client confidence in Hawthorne Bits keeps more "Blue Demons" on more drills, around the world, than any other comparably priced bits. Test and compare the output of your seismic party using "Blue Demons," and you'll standardize on them too.

WRITE FOR ILLUSTRATED CATALOG

HERB J. HAWTHORNE INC.

P. O. BOX 7366, HOUSTON 8, TEXAS



INSERTING INSTRUMENT RACK into sub cavity are Test Engineer Tom Maxwell (left) and Author Carl Canfield. At right Maxwell shows instrument sub in place above bit.

Nine types of subsurface phenomena now can be recorded simultaneously. New vistas in oil well drilling may be opened by this . . .

New Downhole Instrument

By C. R. CANFIELD, Research Engineer, Borg-Warner Central Research Laboratory, Bellwood, Ill.

A NEW "INSTRUMENT SUB" has been developed by the Borg-Warner Corporation, Petro-Mechanics Research Division, which promises to open new vistas in drilling. Developed out of the study on sonic drilling, this downhole instrument offers something new and significant to the industry.

What It Will Measure. Now, it is possible to measure and record at the bit:

- Actual weight on the bit
- Outside mud pressures
- Hole mud pressures
- Temperatures of mud
- Vibrational and chatter frequencies at the bit
- Stresses near the bit
- Acceleration of bit
- Velocity of bit
- Displacement of bit
- Revolution of the bit
- Rotational or vertical motion

This is made possible by a nine station oscillograph built into the drill string near the bit. The instrument does not interfere with mud circulation or complicate drilling operations.

Shock-mounted to withstand the jarring and impact loads incurred at the point of drilling, the unit records the data mentioned above on a 3½-inch strip of specially treated paper about 45 feet long.

Unit Has Own Power Supply. The unit has its own power supply; therefore, no wires connect between the surface and recorder for ordinary measurements.

If it is desired to measure some particular stress on a small area of the rotary bit, it becomes necessary to run two small wires on the outside of the sub.

Tested in Deep Well. WORLD OIL suggested that the new sub be used

UNIVERSITY OF MICHIGAN LIBRARIES

Why This Article Is Important!

This new "instrument sub" may open a new era in the field of drilling technology. The down-well instrument device will record nine sub-surface phenomena simultaneously without the necessity of wires being carried to surface, and will fit standard subs and drill collars.

Primarily designed to evaluate the performance of a new type percussion drill powered by sound, it is finding use as a research instrument for studying rotary drilling.

This instrumentation has divided itself into two main uses.

- **Measurements can be obtained which will result in better bits and better drilling techniques.**
- **The instrument will serve as logging instrument providing more accurate studies by the geologist or engineer. Now it is possible to evaluate formation hardness at 30-second intervals, inclination of the hole during any time bit is on bottom, or almost any other scientific variable desired. This is truly a contribution to the drilling industry.—PHILIP L. McLAUGHLIN, Drilling Editor**

under actual field tests and Borg-Warner's engineers complied by sending the oscillograph 10,000 feet down into a California well. Sample stresses were taken; temperature, pressure, vibration, displacement and velocity measurements were made.

A section from a typical record made during conventional rotary drilling is shown in Figure 6. The following information is included on the record:

Channel 1. Dynamic reference trace (time base omitted)
Channel 2. Monitor trace for D. C. Bridge balance voltage
Channel 3. Vertical vibrating displacements
Channel 4. Vertical accelerations
Channel 5. Rotary vibratory motions
Channel 6. Rotary vibratory velocities
Channel 7. Monitor trace for paper drive motor voltage
Channel 8. Static reference trace

By use of the program sequence timer 45 feet of such record can be exposed continuously for a few minutes or it may be exposed inches at a time over a period ranging from a few minutes between exposures to several hours.

The record shown in Figure 6 was obtained by Tom Maxwell during tests conducted by Petro-Mechanics Research Division of Borg-Warner Corporation, North Hollywood, Calif.

First Time Instrumentation Used. In the past, many devices have been used in attempts to learn just what takes place beneath the surface of the earth while drilling operations are under way, but no record has been found of an attempt to send instrumentation down the hole to record all pertinent variables simultaneously.

Why Instrument Sub Was Developed. A problem for the Borg-Warner Petro-Mechanics Research Division has been to analyze and evaluate a new and different type percussion drill powered by sound. In doing this, all the old, and many new, phenomena had to be faced, and it was felt that the best approach was to measure these phenomena as they occurred in their native environment.

Thus, the decision to employ down-hole instrumentation. It appeared that if a nine-channel recording oscillograph could be fitted to an oil drill, the possibilities would be unlimited. To be practical, the system would have to be capable of measuring and recording most of the physical variants; stresses, pressures, temperatures, accelerations, impacts, vibration, displacement, time, and velocity. With nine recording channels available, any two variables could be covered at one time and still maintain correlation with the remaining ones.

Elements of Instrumentation. The basic elements of the instrumentation include a nine-channel recording oscillograph with a record speed of six inches per second, and including integrating galvanometers; and oscillator to provide timing marks at 1, $\frac{1}{10}$, and $\frac{1}{100}$ seconds; a nine-channel bridge balance; a program sequence timer; a power supply for the bridge of 3-6 and 9 volts DC; and a 24-volt DC power supply for the recorder and sequence timing motor.

Instrument Sub Measurements. This sub-surface instrumentation is installed in the drill string between the bit and the drill collars in an "instrument sub" in such a manner as to be pressure tight, yet allow a full flow of drilling mud to circulate. Information from any type of pickup, i.e., strain gauges, transducers, velocity pickups, or other measuring devices can be recorded. The instrument will measure and can record: actual weight on the bit, outside mud pressure, hole mud pressure, temperature of the mud, and vibrational and chatter frequencies at the bit; stresses near the bit; and acceleration, velocity, displacement, and revolutions per minute of the bit. Measurements of either rotational or vertical motion may be recorded. Recording time may be controlled by a data-sequence programmer contained in the instrument.

The starting mechanism of the instrument is actuated by a surge of the mud pressure by the surface mud pumps. The recorded information is removed quickly from the instrument when the drill string is taken from the well to replace the bit.

Oscillograph Shock-Mounted. The recording oscillograph was shock-mounted to the instrument rack, through its side flanges, while the remaining instrument-sub components were mounted solidly to the rack. The end of the rack contains a

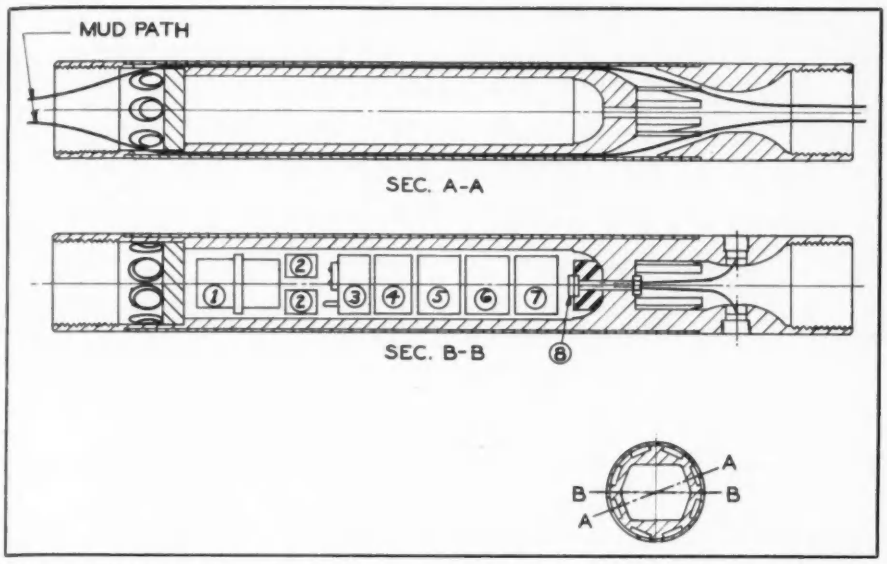


Fig. 1—Sub layout. 1—recorder oscillograph; 2—attenuator; 3—timing oscillator; 4—timer motor; 5—program sequence timer; 6—bridge power supply; 7—oscillograph and oscillator power supply; 8—harmonica 37 point connector.

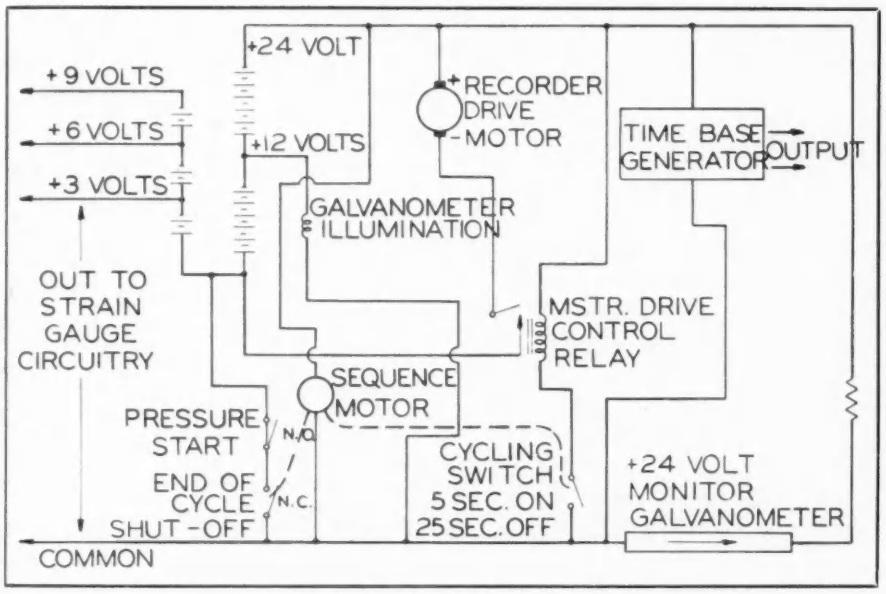


Fig. 2—Circuit Layout.

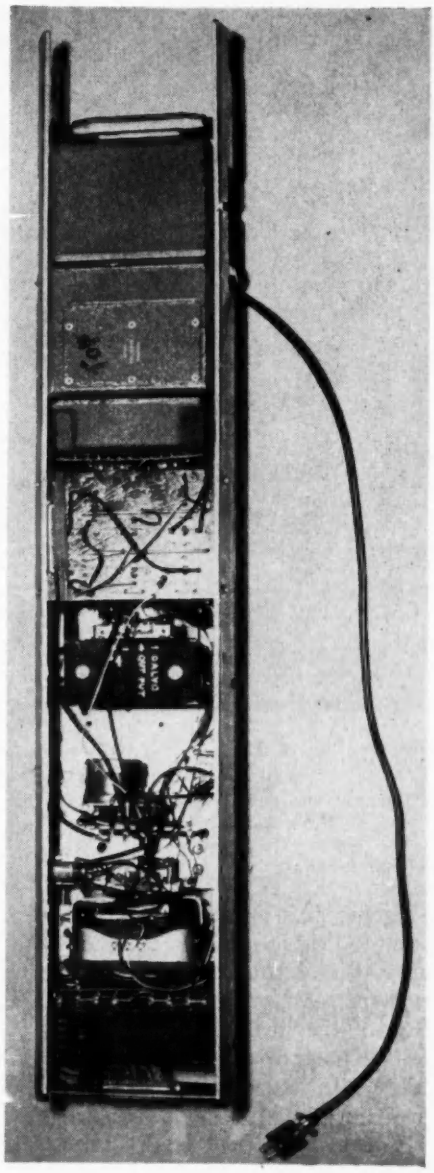


Fig. 3—Instrument rack.

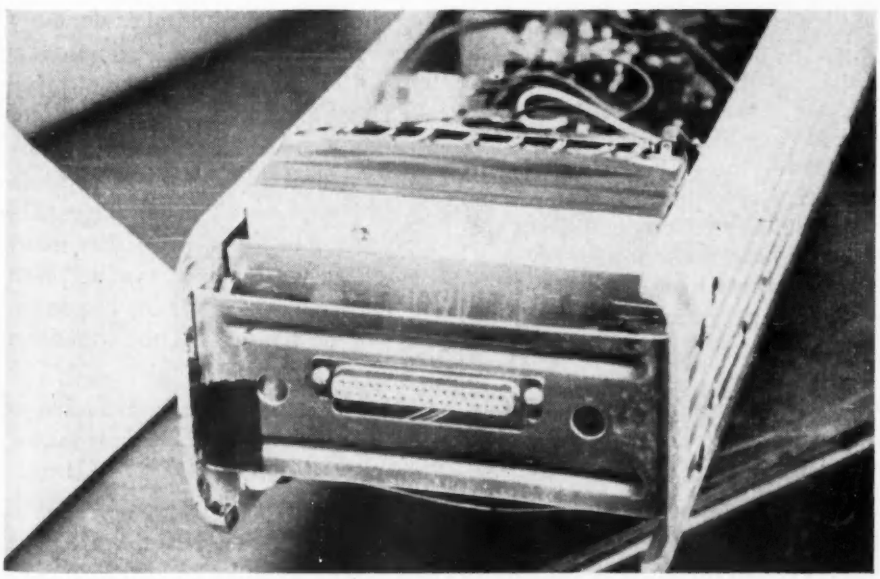


Fig. 4—End of rack—37-point plug.

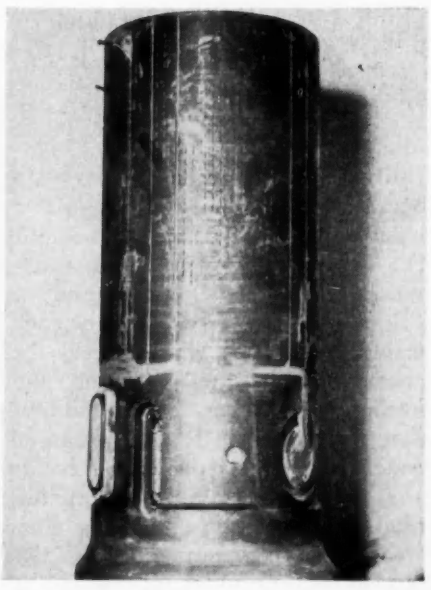


Fig. 5—External connections on end of sub.

UNIVERSITY OF MICHIGAN LIBRARIES

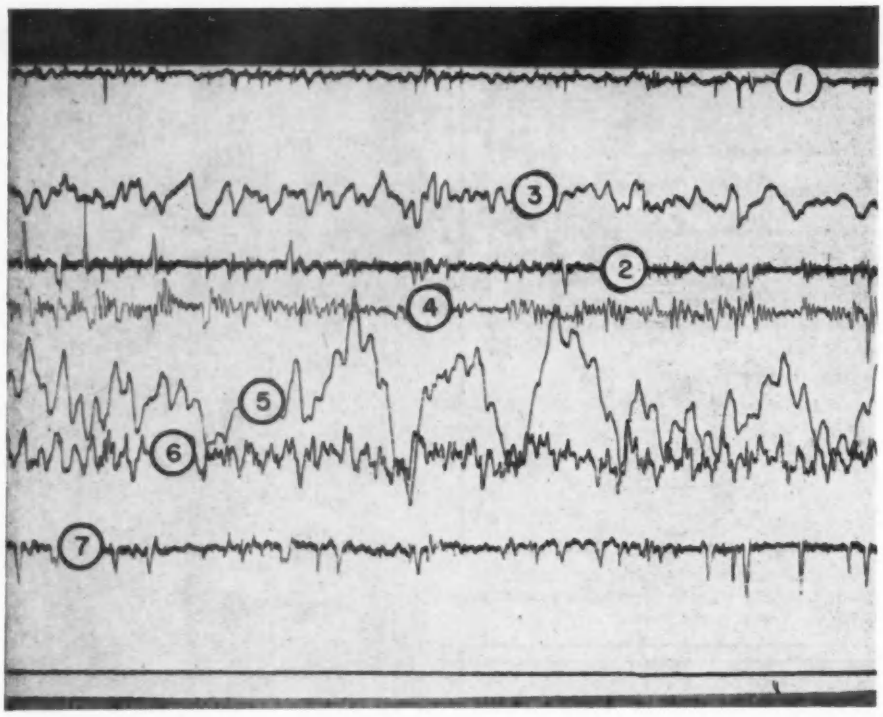


Fig. 6—Record taken on a 10,000-foot well in California by recording oscillograph. Tracers represent the output from velocity pickups to indicate vertical and rotary displacement and rotary velocity from an accelerometer, and from galvanometers used as reference traces. Record speed was six inches per second.

37-point sub-miniature connector, mounted as shown in Figure 4. Sliding the rack into place automatically engages a 37-point receptacle at the base of the instrument sub. The DC bridge balance used was constructed of 20-turn, 10,000-ohm sub-miniature trim pots.

Power to Recorder. Power to the recorder and timing oscillator is supplied by special photoflash cells. Power for the bridge circuits is supplied through mercury cells. The 37-point miniature connectors measure ½ by 2½ inches.

Construction of Unit. The many wires servicing the nine-channel oscillograph are carried in narrow grooves milled down the length of the tool. The wires used were potted in epoxy resin. The potting was carried to within six inches of the end of each section; this work was done in the laboratory. The final make-up and potting of joints was done in the field after assembly on the rig, a special heater having been constructed to cure the epoxy resin in a very few minutes. The many incoming lines from transducers terminated at two 18-point plugs mounted at the end of the instrument sub. Eighteen wires from each of these plugs were carried through heavy neoprene tubing and down into the 37-point connector mentioned previously. The end fittings of these plugs were potted in epon. A separate 37-point receptacle was wired in parallel and fitted flush with the surface in the side of the instrument sub with an "O"-ring seal protected cover. Through use of this plug the instrument rack could be removed and, using an extension, adjusted and repaired as required in the field.

Whenever possible, bridges of four active gauges were employed. The output signal was fed through the DC bridge balance into galvanometers without amplification. Two channels contained integrating galvanometers for direct recording of signals from self-generating velocity pickups. A special matching network with seven attenuation steps from 1 to 100 was included to accommodate these two channels.

Instrument Sub Described. The instrument sub itself is constructed to give an instrument cavity approximately 5 inches square and 30 inches in length. The walls contain tubular sections which carry the mud flow of 700 gallons per minute at pressures in excess of 7000 pounds per square inch. The entire assembly has been designed for use at sub-surface depths of 10,000 feet.

Outlook. Many individual problems remain to be solved in downhole instrumentation, but with today's advances in science the tools with which to attack these problems are available. The tests run to date have proven that it is possible to deal with Mother Nature on her own terms and come up with answers to secrets she has held for centuries.

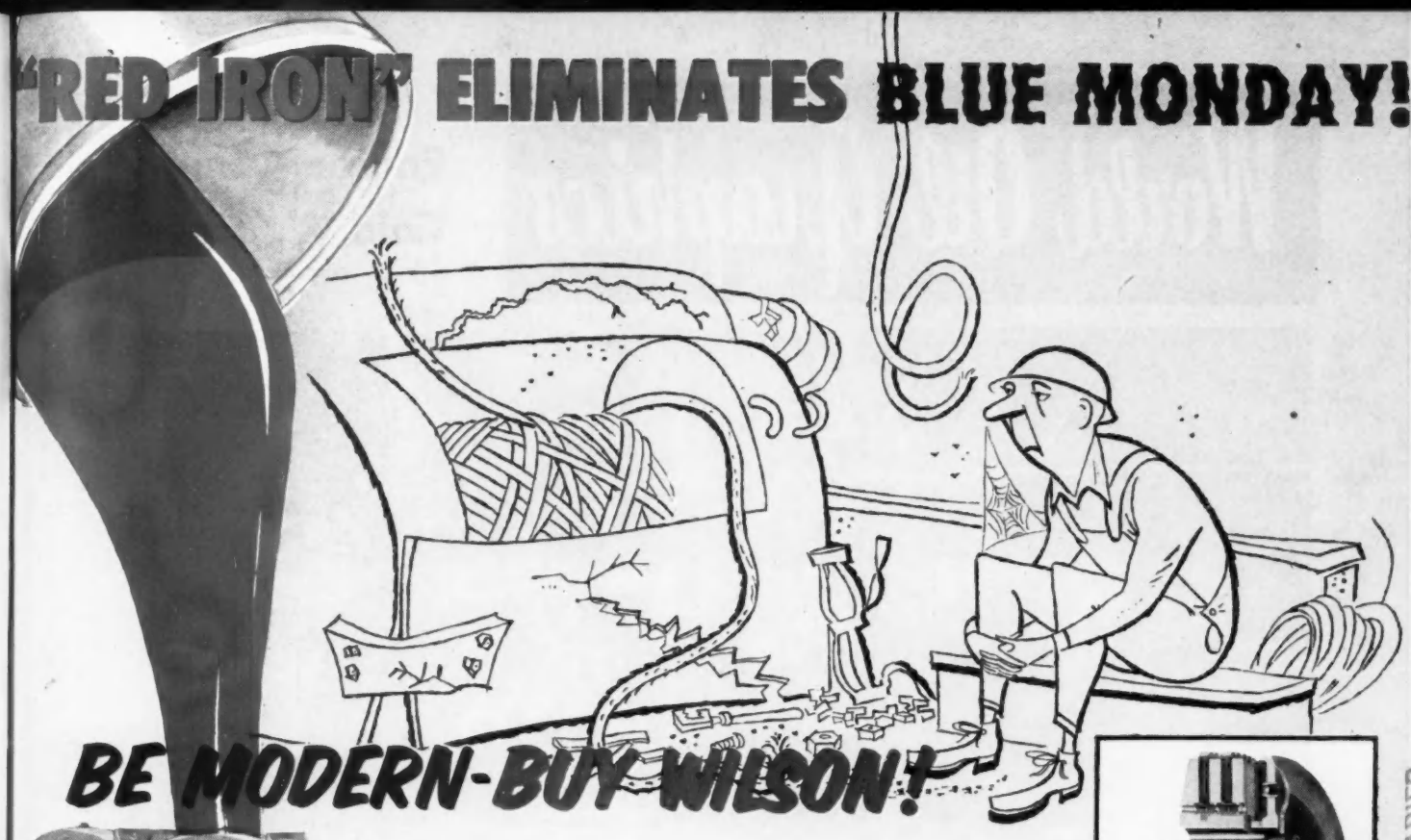
Currently the uses for this instrumentation will divide itself into two main uses:

- One will be concerned with measurements which can result in better drills and better drilling techniques. Very accurate engineering and scientific data of the actual drilling process can be obtained and drilling techniques can be modified so that they are of maximum efficiency. For instance, it is probable that the drilling rate will be determined by the actual amount of force with which the drill hits the formation. This is far different than the weight on bit as measured on the drilling floor. Also this measurement can be made over very short periods of time, and the effect of drilling mud pressure on this force can be readily determined.

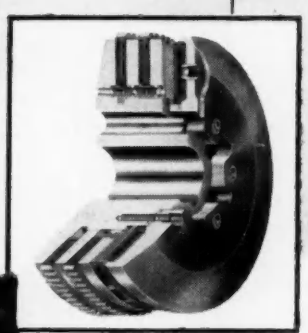
- A much wider and if not more important use of the instrumentation will be as a logging instrument. The instrument can be put on regular drilling strings and records taken out every time the bit is changed. Almost any type of record that would be of interest to the petroleum geologist or production man could be made on each time the drill is in the hole. The speed of the paper going through the oscillograph can be changed so that many short interval readings can be taken so that one might obtain, as for instance, the hardness of the formation every 30 seconds.

The instrument can be modified so that the inclination of the hole during any part of the time it was on bottom could be recorded and would be available for study almost immediately after the instruments were brought to the surface. —**The End**

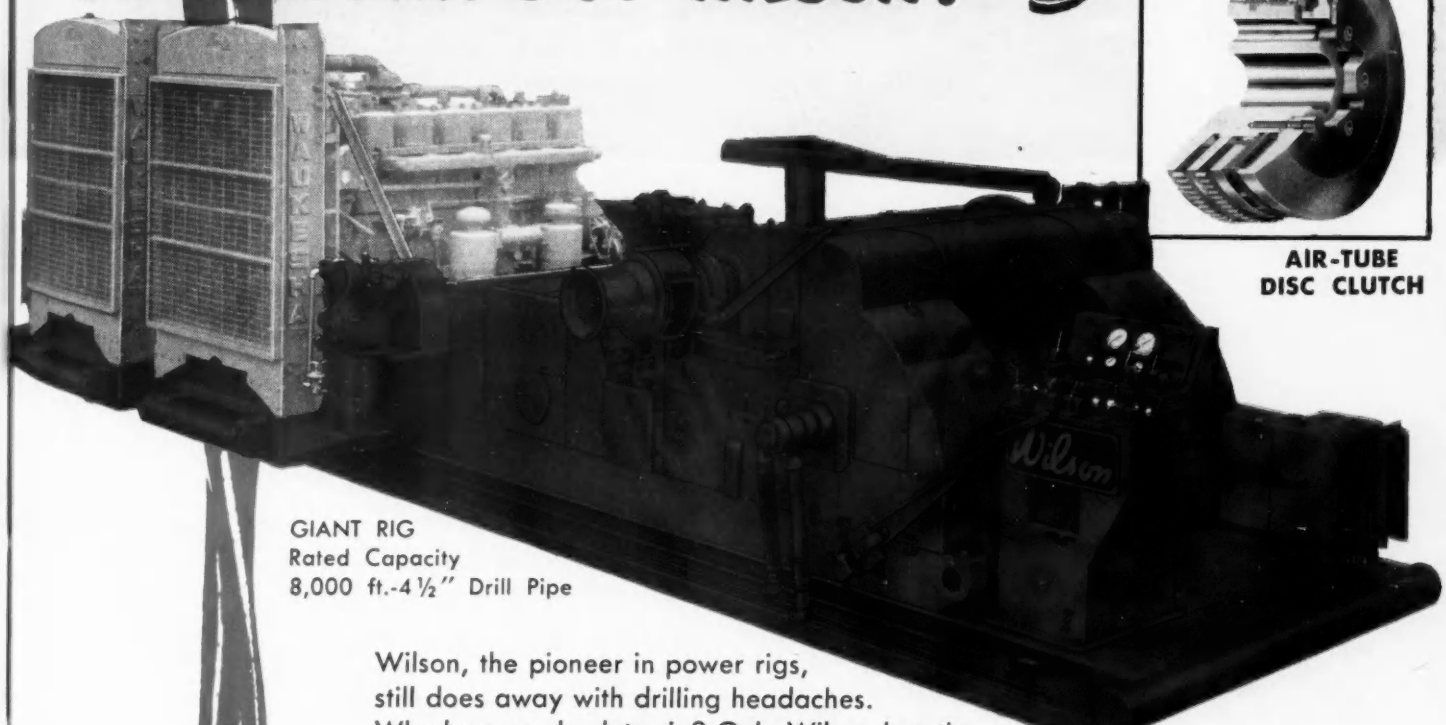
"RED IRON" ELIMINATES BLUE MONDAY!



BE MODERN-BUY WILSON!



AIR-TUBE
DISC CLUTCH



GIANT RIG
Rated Capacity
8,000 ft.-4½" Drill Pipe

Wilson, the pioneer in power rigs,
still does away with drilling headaches.
Why buy an obsolete rig? Only Wilson has the
all-friction clutch compound and transmission drive. Get up-to-date,
and do away with the trouble of trying to maintain several types of clutches
on one rig. Wilson built the first chain-drive transmission, with
jaw clutches. Then Wilson built the first and *only* chain-drive transmission
and compound with all-friction clutches. Use the finest clutch built,
the Air-Tube Clutch. Be modern, buy Wilson, and forget BLUE MONDAY.

Wilson

The FIRST NAME in DRILLING RIGS!

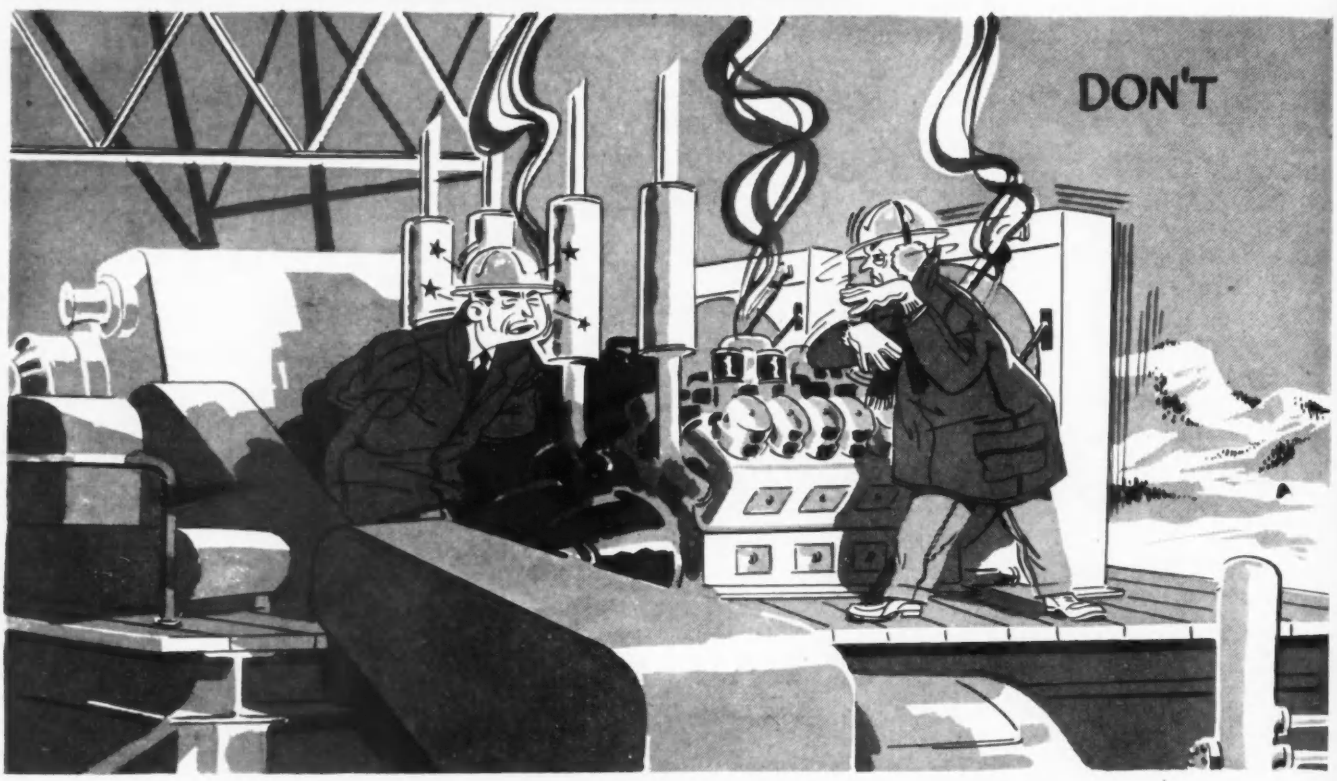
WILSON MANUFACTURING CO., INC.

The HOME of RED Iron • WICHITA FALLS, TEXAS, U.S.A.

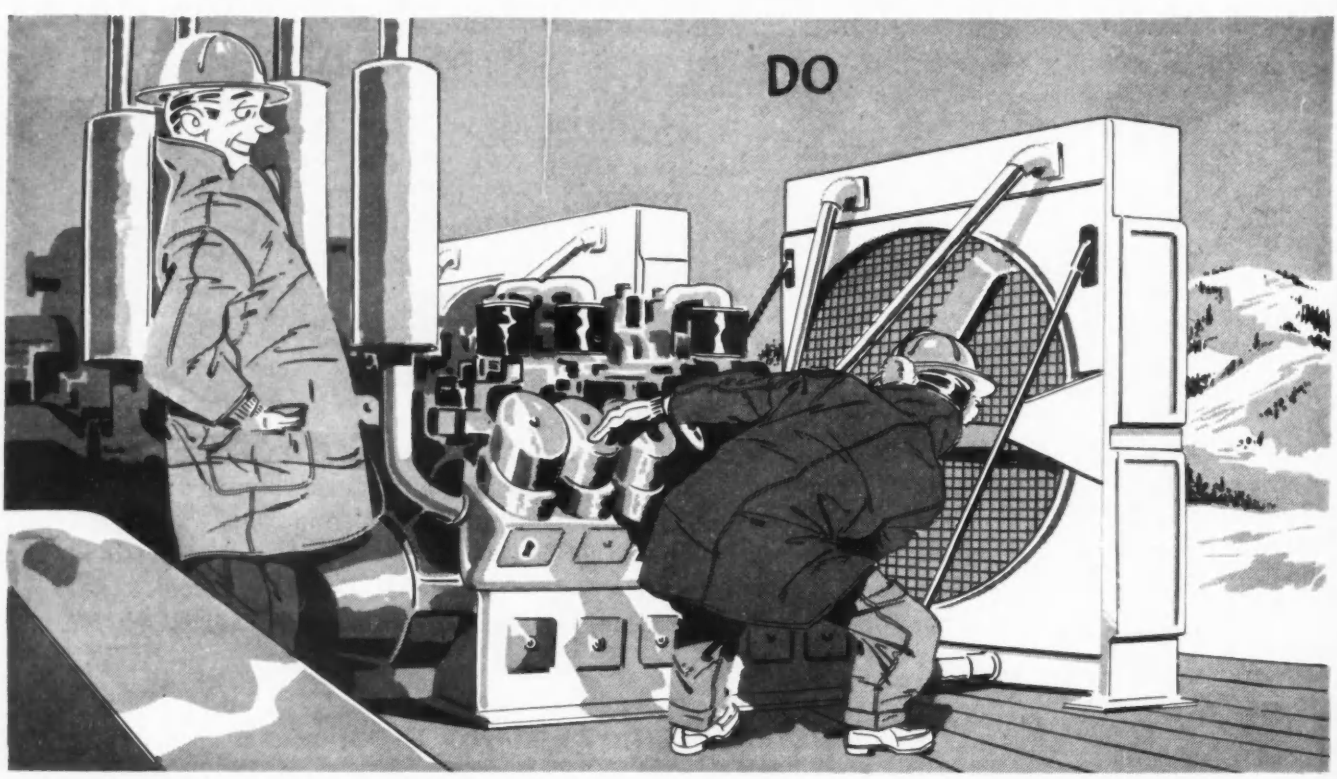
UNIVERSITY OF MICHIGAN LIBRARIES

World Oil Graphics

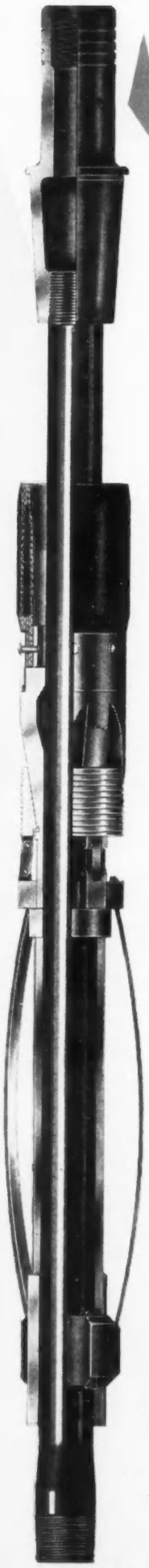
Engine Care in Cold Weather



Failure to drain water pump when engine down allows ice to form; may cause pump impeller damage when retarded.



During repair shutdowns, drain water pump body and radiator. Install discharge pressure gauge.



NOW THE AMERICAN IRON TYPE "S" PACKER

is made more effective than ever when used with AMERICAN IRON'S

NEW *Hydraulic-Mechanical* PACKER HOLDDOWN TYPE "HD"

The new American Iron Type HD Packer Holddown is designed to hold the packer in place in applications where pressure below the packer is considerably greater than pressure above. When Type HD Packer Holddown is set, you are assured of a positive anchor by a combination hydraulic and mechanical latch.

The American Iron Type HD Packer Holddown is the only packer holddown on the market that can be released without first equalizing pressures above and below packer. In releasing the Type HD Packer Holddown there are no extra valves or pressure release mechanisms to contend with; merely pick up on tubing, which in turn lifts slip mandrel and releases dovetail type slips from casing.

Recommended especially for:

- High Pressure Acidizing
- Formation Fracturing
- Water Flood Input Wells

AMERICAN IRON & MACHINE WORKS CO. · MANUFACTURERS OF OIL FIELD EQUIPMENT · A · REG. U.S. PAT. OFF. · OKLAHOMA CITY U.S.A. ·

AMERICAN IRON & MACHINE WORKS CO.

OKLAHOMA CITY, OKLA. - BOX 1177

UNIVERSITY OF MICHIGAN LIBRARIES

Here's How The Ohio Oil Company Drilled the World's Deepest Well

- The equipment used and how it was used.
- The problems faced and how they were solved.
- The men who did the job.

By GILBERT M. WILSON,
WORLD OIL Staff

WHEN THE BIT in The Ohio Oil Company's KCL A 72-4 drilled past 20,521 feet early in the afternoon of August 20, 1953, something more than a new depth record was established. It proved something. It demonstrated in a conclusive manner that, given good equipment, though not necessarily the heaviest; a team of men exercising a fine degree of coordination and skill, from management to the man on the rig floor; and all-out assistance of numerous oil industry service companies, feats considered impossible only a few years ago dropped into place as routine accomplishments. It symbolized, perhaps, the things which have characterized the progress of the oil industry during the 95 years that followed Col. Drake's completion of his 69-foot deep test.

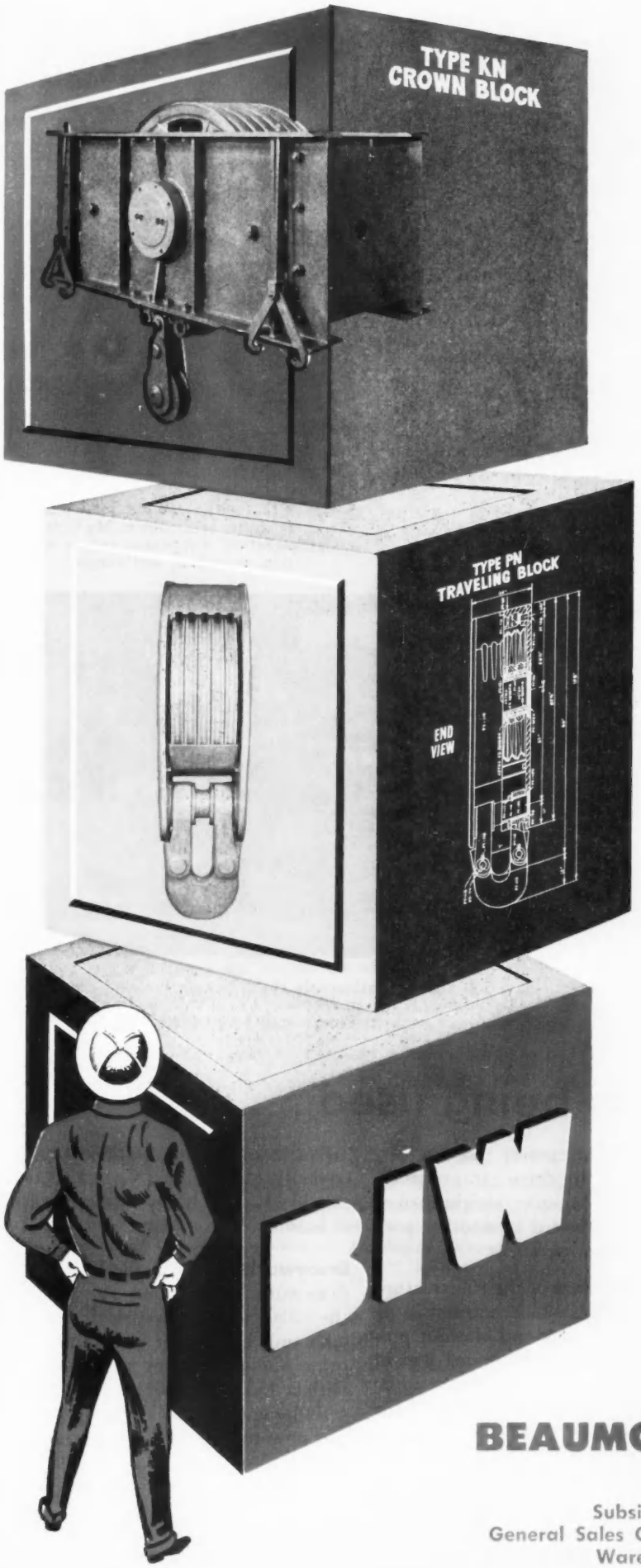
At this writing, with total depth of the hole at 21,482 feet, Ohio still is fishing for drill pipe that stuck just as a core was being pulled from bottom, a core that might contain a significant answer as to whether drilling might be continued if and when the fish is recovered.

The fishing job, however, does not dim the achievements wrought by Ohio personnel, service companies and others who had a part in successfully drilling a hole to the present depth of more than four miles.

Perhaps the most outstanding feature of the project was the fact that the equipment used was not the largest, nor the heaviest.

CONTINUED

WORLD'S DEEPEST WELL. This picture was taken while crew was changing diamond bit with depth of hole at 20,246 feet. Stacked in derrick are 164 fourbles of 4½-inch drill pipe weighing nearly 174 tons.



BIW BLOCKS

BUILD GREATER DRILLING EFFICIENCY!

New, two way bearings on the Type KN Crown Block and the Type PN Traveling Block handle both radial and thrust loads as pure right angle loads. This design increases bearing capacity, reduces weight, and cuts space requirements. Longer bearing life results plus reduced maintenance and replacement costs.

The Crown Block can be hoisted through the water table in one piece. Because the center pin is on the center line of the beam, either flange of the beam can be set on the water table beams. The narrow width of the 300 ton capacity Traveling Block permits maximum pipe racking for deep drilling. With its low center of gravity, kicking or side lift is kept to a minimum. Bearings and sheaves are interchangeable between Crown and Traveling blocks.

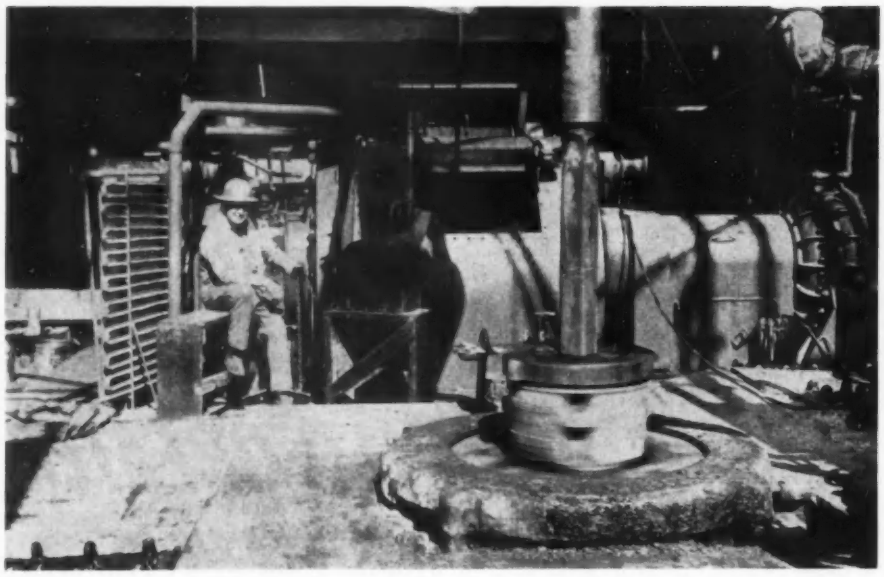
Write for the complete story on what these blocks can do to cut your drilling costs, increase your drilling efficiency. Beaumont Iron Works, one of the oldest oil country manufacturers, builds a complete line of drilling and producing equipment.

BEAUMONT IRON WORKS CO.

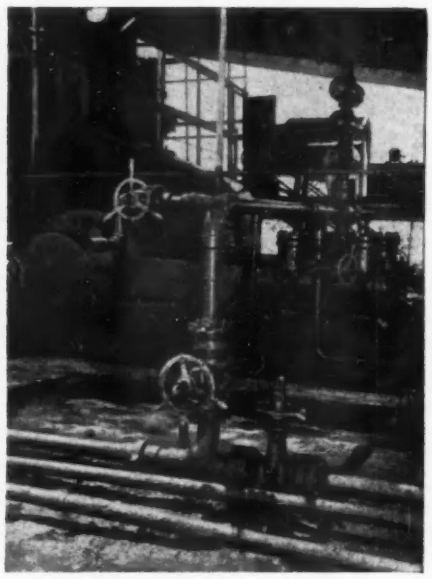
Beaumont, Texas

Subsidiary of American Locomotive Co.
General Sales Office: 1404 Dunlavy St., Houston 19, Texas
Warehouses in Beaumont and Odessa

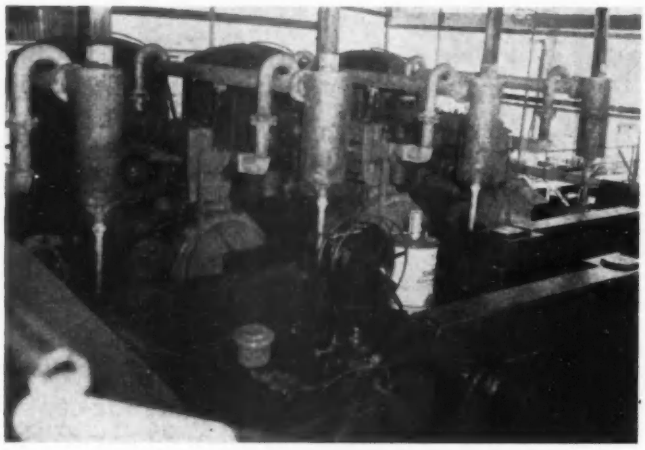
UNIVERSITY OF MICHIGAN LIBRARIES

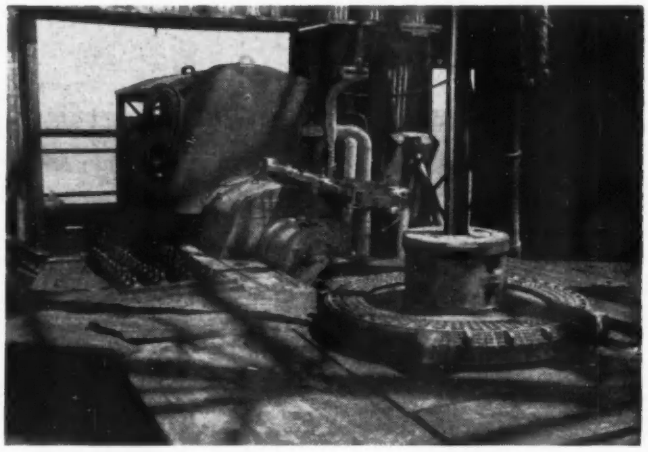


GOING DOWN. This general view shows the drawworks and other equipment used on The Ohio Oil Company's record-breaking KCL A 72-4 well in the Paloma field of Kern County, California. Driller Fred Ryan is at the controls.



MUD PUMP. The 350-HP mud pump is driven by drawworks engine. Multiple cartridge pulsation dampeners reduce vibration, pulsation, and surges.





FOUR 350-HP GAS ENGINES (left) which drive the drawworks and main mud circulating mud pump, and the drive group, are supported on separate substructure. The four engines, plus two similar engines powering mixing and auxiliary pumps, have run almost continuously since digging the rat hole. Rotary table (right) is driven by twin 150-HP diesel engines, driving through a torque converter.

Standard equipment is being used . . .

Rig and equipment used on the well, though classed as "heavy," are of conventional size and type. The current project is the third well and the second record that the 2000-horsepower company-owned rig has drilled within the past five years.

The 164-foot steel derrick has a 30-foot base and 14-foot, 8-inch high substructure. The engine and drawworks substructure is mounted independently of the derrick floor substructure so vibrations from drilling equipment will not be transmitted to the derrick.

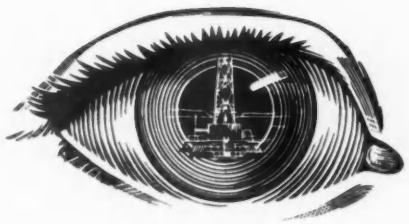
The engine substructure, 9 feet, 3 inches high, supports the 21-ton load of four 350-horsepower gas engines, together with drive transmission group. The drawworks, weighing over 38 tons, is supported by another portion of the substructure.

A safety feature of the substructure is the ease with which access can be gained to the cellar and blowout prevention equipment. Extended legs of the rig permit the substructure to be moved in or out independent of the derrick structure.

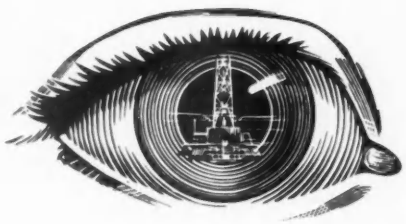
Hazardous cross-bracing of conventional substructures has been eliminated by the use of cantilever-type supports. The substructure has a casing or drill pipe support capacity of 300 tons and a rotary table support capacity of 150 tons. Crown, traveling block, and hook, also are rated to handle 300-ton loads.

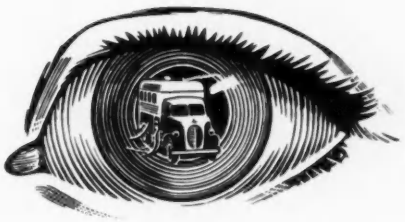
Drawworks. Two of the four-engine drawworks drive group power one of the 350-horsepower slush pumps. This unit is used for circulating. Another 350-horsepower pump together with a 250-horsepower unit, used for standby and mud-mixing respectively, are powered by two 350-horsepower gas engines of the same type as those in the drawworks drive group.

Rotary table. The independently driven 20½-inch rotary table is



drill...





with both eyes open!

Use Core Lab's Well Logging Service . . . . Each foot drilled is logged for drilling time . . . Cuttings are minutely analyzed for hydrocarbon concentration indicating oil and gas . . . Gas concentration in drilling mud is measured continuously to reduce the possibility of blowouts . . . Physical characteristics of mud (weight, viscosity, water loss) are measured each tour . . . Data on cuttings and mud are plotted versus depth for interval logged . . . Stray pays are picked up when encountered, while anticipated productive zones are pin-pointed without unnecessary "pre-coring". The same Core Lab crew and portable equipment are immediately available to perform On-Location Core Analysis at no extra charge. *Drill with both eyes open. Drill with Core Lab's Well Logging Service.*

CORE LABORATORIES, INC. ● **IN ALL ACTIVE AREAS**

Dallas, Houston, Corpus Christi, Midland, Abilene, San Antonio, Tyler, Wichita Falls, Lubbock, Oklahoma City, Ft. Worth, Great Bend, Shreveport, Lafayette, New Orleans, Natchez, Bakersfield, Denver, Sterling, Worland, Williston, Billings, El Dorado, Hattiesburg, Farmington, Lovington, Calgary, Edmonton.

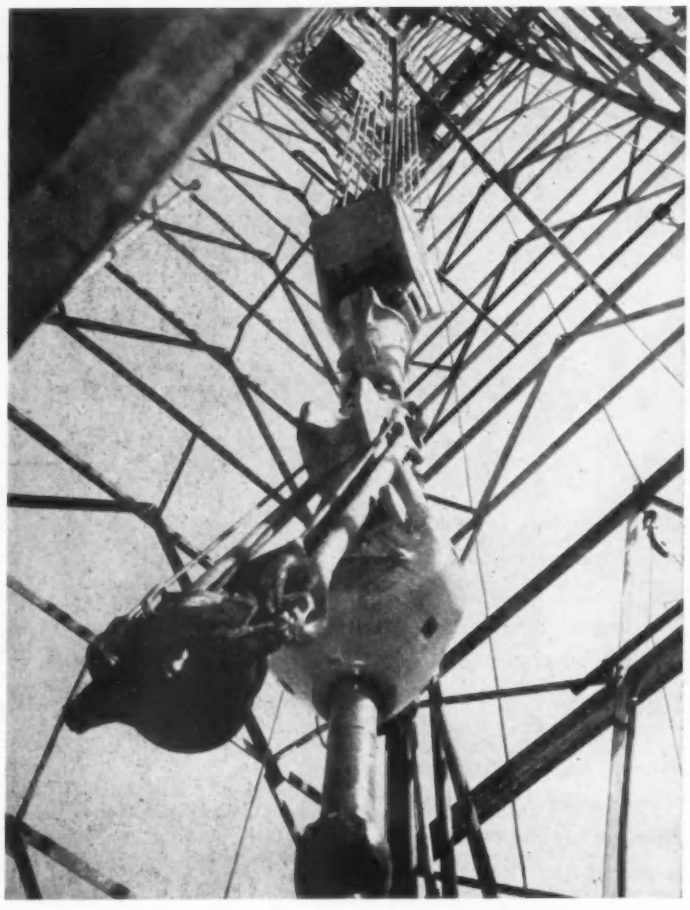
CORE LAB
WELL LOGGING SERVICE

UNIVERSITY OF MICHIGAN LIBRARIES

powered by a 300-horsepower twin diesel unit, drive being through a torque converter.

Blowout prevention equipment, installed on the 9⅝-inch protection string consists of two hydraulically operated ram-type heads; the lower one providing complete close-off; the upper one designed to close around the drill pipe. Atop these two units is an all-purpose head designed for either shut-off around anything in the hole, such as drill pipe, kelly or drill collars, or for a complete shut-off with nothing in the hole.

Good record. During the more than two years of almost continuous operation—with engines running an estimated 90 percent of the entire operational time—there have been no major breakdowns of the engine powering the drawworks and mud pumps.



TEN LINES have been strung between about 15,318 feet and the present total depth of 21,482 feet.

Wire line moved often . . .

The drilling line, 1¼-inch improved plow steel wire rope with independent wire rope center, is believed to have withstood the most severe test ever given a line of this size in the drilling industry. The previous world's depth record, Superior Oil Company's Sublette County, Wyoming, 20,521-foot deep test, was drilled with 1½-inch wire rope.

Cutting program. Great care was taken by The Ohio Oil Company to maintain a sound moving and cutting procedure during the course of the drilling operations. That this succeeded is attested to by the fact that there were no accidents and no trouble with the wire rope from spudding-in to the reaching of the present total depth.

From 15,000 feet on down, a rigid program of line cutting was followed. This program specified moving from three to five feet after every round trip, and at the end of every fourth round trip, cutting off 100 feet. Below 16,000 feet 100 feet of line was removed after every round trip.

A rigorous test of the wire line came when 10,947 feet of 9⅝-inch casing was run in and cemented. This string, believed to be one of the heaviest casing strings ever run in California, if not the world, weighed 513,732 pounds. For this job, the company rigged a 6000-foot line, the longest drilling line ever used in the state, and perhaps the longest used anywhere. However, since setting this string, 5000-foot spools have been used.

Eight lines were strung between surface and setting of the 9⅝-inch protection string at 10,947 feet. Ten lines were strung to run casing after which eight lines were used to a depth of 15,318 feet. From that point to present total depth, ten lines have been strung.

Drill pipe used is combination string . . .

Drill pipe used is a combination string of 4½-inch, 17.35 pound per foot, internal flush, integral joint, vanadium steel having a mill-tested minimum yield strength of 105,000 pounds per square inch, and Grade E pipe. At the time the well broke the previous world's record of 20,521 feet, the string in the hole included 16,000 feet of 4½-inch pipe with 6⅛-inch outside diameter tool joints, with the balance being made up by 16.6-pound full-hole pipe with 5¾-inch OD tool joints. In addition, the string included five 6-inch by 30-foot drill collars.

At that depth, the weight indicator showed a weight of 282,000 pounds, with 4000 to 5000 pounds weight on the bit.

Round-trip time, below 13,877 feet when nearly continuous coring started, steadily increased, with depth, from 6½ hours to 11 hours per trip.

CONTINUED

the answer to many of your drilling problems

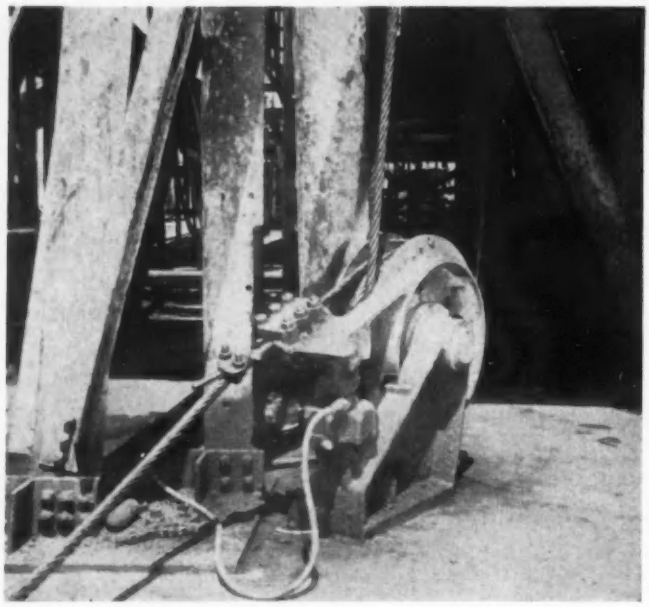
TRUCO CONCAVE DRILLING BITS

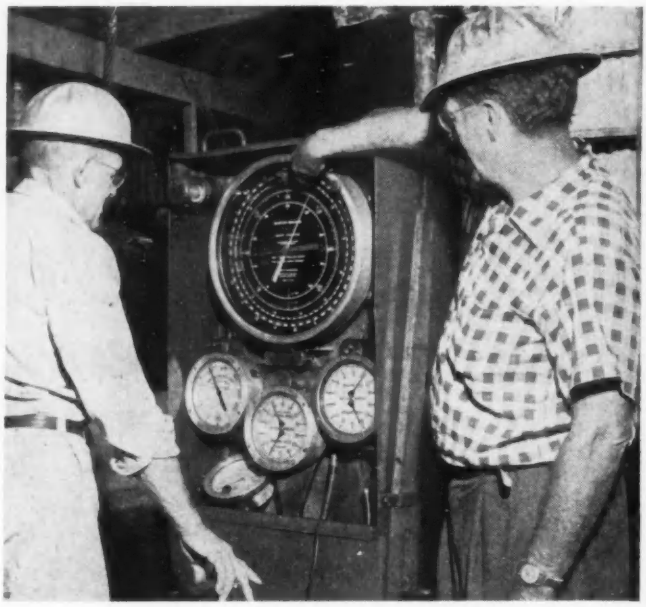
When you're making hole too slow and making trips too often it's time to consult your nearest D & S Field Engineer about Truco Concave Drilling Bits. Trucos do the job faster at less cost per foot.

DRILLING & SERVICE
3031 Elm Street
Dallas 1, Texas

TRUCO DIAMOND BITS AND D & S CORE BARRELS

UNIVERSITY OF MICHIGAN LIBRARIES





WIRE LINE ANCHOR used is of the type which combines a snubbing drum and pressure transformer, the unit being anchored beside derrick leg (left). Instruments at the driller's position (right) include weight indicator, mud pump pressure gauge, two double vacuum gauges, and a rotary table tachometer.

Heaviest casing string . . .

Except for the intermediate string, casing and cementing practices employed thus far have been more or less conventional. Eighteen-inch conductor pipe was cemented at 61.57 feet prior to spudding in. From there to 1431 feet, 12¼-inch hole, later reamed to 17-inch, then was drilled. A string of 13⅜-inch, 54.5-pound casing was cemented to surface with 875 sacks of construction cement. At this point blowout prevention equipment was installed and tested.

Except for the interval 6670-6765 feet, which was cored with a conventional 8½-inch core barrel to inspect a possible gas sand, which proved to be wet, a 12¼-inch hole was drilled from the shoe of the 13⅜-inch down to 10,947 feet. It was to this depth that the 9⅝-inch string, one of the heaviest strings, if not the heaviest, ever run, was set and cemented. This string, made up of from 43.5 to 53.5 pound pipe, and equipped with 16 scratchers and 6 centralizers, required 13¼ hours to run to bottom. Make up and weight of this string, (including 5.96-feet extending above rotary table), reading from top to bottom, is as follows:

5 joints, 53.5-lb.	202.49 ft.	10,833 lbs.
161 joints, 43.5-lb.	6,248.59 ft.	271,814 lbs.
39 joints, 47.0-lb.	1,502.32 ft.	70,609 lbs.
74 joints, 53.5-lb.	2,999.56 ft.	160,476 lbs.
279 joints	10,952.96 ft.	513,732 lbs.

The string was equipped with a float shoe, plus a float collar on the top of the 44-foot shoe joint. Scratchers were located at the following points in the string: 10,936; 10,928; 10,920; 10.912; 10,898; 10,889; 10,880; 10,871; 10,366; 10,356; 10,346; 10,336; 10,029; 10,019; 10,008; and 9,998 feet. Centralizers were installed at: 10,943; 10,859; 10,362; 10,325; 10,025; and 9,994 feet.

String was cemented with a 1000-sack equivalent of 1:1 lightweight aggregate mix, four percent gel, high temperature cement, 89-pound per cubic foot slurry, followed by 200 sacks of neat high temperature cement, mixed to 116-pound per cubic foot weight. Three cement trucks were used on the cementing job. Fifty cubic feet of water was put behind the two top rubber plugs which were bolted together with a magnesium bolt.

Cement was displaced for 44 minutes, when pressure abruptly built up to 2650 pounds per square inch, with 267 cubic feet of slurry out of the shoe. Pumps were rocked and pressure broke at 2300 pounds per square inch. Displacement was continued and plugs were bumped at 1500 psi.

Fourteen cubic feet of mud was bled back in order to set the floats. After standing for 12 hours, a temperature survey was run which indicated top of cement behind the pipe to be at 8400 feet. Running in with an 8⅜-inch bit and scraper to clean out, top of the cement inside the pipe was found at 10,892 feet, 11 feet above the float collar.

Safety factor. The extraordinarily heavy casing string was designed to provide a tensile safety factor of over 2, and, on the basis of 82 pounds per cubic foot (11 pounds per gallon) drilling mud, a collapse resistance factor of 1. The company thought it advisable to run the heavy protection string through the present producing sand in the field and designed it to have ample strength to withstand possible production usage. Main producing interval in the Paloma field at present is from the Stevens zone of Miocene age found (depending upon structural position) at depth of from 10,000 to 11,950 feet.

Hole from the 9⅝-inch shoe at 10,947 feet down to present total depth of 21,482 feet still is open, an interval of 10,535 feet. If and when the fish is cleared and decision is made to run pipe to bottom, it is contemplated that a string of 5½-inch, 26-, 23-, and 20-pound casing will be run in order to test the well. Should casing be run, plans already formulated call for selectively perforating and testing undisclosed intervals in the hole.

CONTINUED

EASTMAN FIRSTS...

FIRST... WITH PLANNED DIRECTIONAL DRILLING SERVICE

FIRST... WITH A MODERN TYPE SINGLE SHOT SURVEY INSTRUMENT

FIRST... WITH A WIDELY ACCEPTED MECHANICAL SELF CHECKING DRIFT INDICATOR

FIRST... WITH A QUICK ACTION SNAP-LOCK DRIFT INDICATOR BARREL THAT DOES NOT REQUIRE WRENCHES*

*IF YOU ARE NOT USING THIS NEW BARREL — CALL YOUR NEAREST EASTMAN OFFICE FOR A DEMONSTRATION

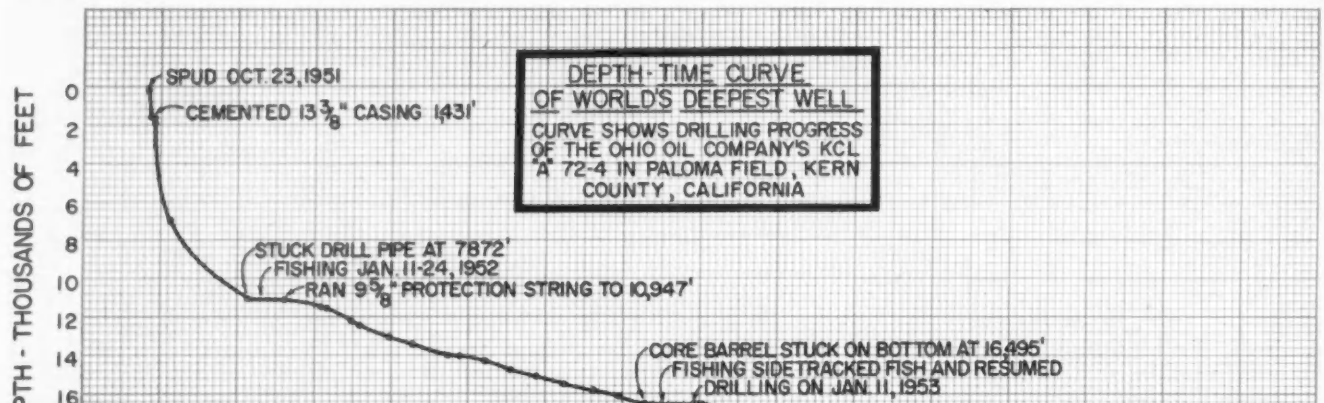
...Good reasons why Eastman Oil Well Survey Company Leads The Field in Oil Well Surveying and Directional Drilling Service...

Call an Eastman Engineer today; He's ready to serve you Anywhere, Anytime!

Eastman Oil Well Survey Company
LONG BEACH DENVER HOUSTON

Export Sales and Service:
EASTMAN INTERNATIONAL COMPANY
Denver, Colorado

DIRECTIONAL DRILLING Eastman OIL WELL SURVEYS


DEPTH - THOUSANDS OF FEET
0
2
4
6
8
10
12
14
16
18
20
22
DEPTH-TIME CURVE OF WORLD'S DEEPEST WELL
CURVE SHOWS DRILLING PROGRESS OF THE OHIO OIL COMPANY'S KCL "A" 72-4 IN PALOMA FIELD, KERN COUNTY, CALIFORNIA
SPUD OCT. 23, 1951
CEMENTED 13 3/8" CASING 1,431'
STUCK DRILL PIPE AT 7872'
FISHING JAN. 11-24, 1952
RAN 9 5/8" PROTECTION STRING TO 10,947'
CORE BARREL STUCK ON BOTTOM AT 16,495'
FISHING SIDETRACKED FISH AND RESUMED DRILLING ON JAN. 11, 1953
CORE BARREL STUCK ON BOTTOM AT 21,485'
FISHING
TOP OF DRILL PIPE FISH 13,242' ON JAN. 27, 1954
S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M
1951
1952
1953
1954

Diamond bits used . . .

EXAMINING CORES. District Geologist R. W. Shoemaker (left) and Geologist Tom Wilson from The Ohio Oil Company's Bakersfield office examine a core from the 5143 feet of cores laid out on platforms beside derrick of the world's deepest drilling well.

Conventional rock and core bits were used in making hole from surface down to 10,947 feet, shoe depth of the 9⅝-inch protection string. From that depth on, however, diamond bits or core heads were used almost exclusively. Hole size from the shoe to total depth has been 8⅜-inch and 8¼-inch.

Ninety-five feet was cut with conventional core heads and the remainder with diamond core heads. A total of 11 cores, amounting to 271 feet of core, were taken at selected intervals down to 13,877 feet. Below 13,877 feet, about 81 percent of the hole was cored. About 25 percent of the entire penetrated interval has been cored. In all, 133 cores, totaling 5186 feet have been taken.

A rate of penetration log, started at a depth of 9838 feet, has given a close and accurate record of the penetration rate to total depth. Although extreme highs and lows have been noted, the average rate of penetration for diamond bits and diamond coring heads has been about 1 foot an hour in shale and from 2 to 3, sometimes as much as 4, feet per hour in sandstone.

Down to a depth of 20,000 feet, the well had logged about 49.5 percent sandstone and, in the Miocene section from 8800 to 20,000 feet, sandstone accounted for 49 percent of the

TABLE 1

BIT RECORD of the Ohio Oil Company's Kern County Land Company "A" 72-4, Paloma Field, California, World's Record Deep Well to 20,529 feet, August 21, 1953.

Abbreviations: RB—Rock Bit; C—Core-Head; RM—Reamer; DB—Diamond Bit; DC—Diamond Core-Head; R—Re-run; S—Sidetracking; CO—Cleaning Out

Bit No.	Type Bit	Size	Depth On	Depth Off	Total Feet	Hours	Av. Ft.	Explanation
1	RB	12¼	0	1431	1431	17	84.17	
2	RM	17	0	1431	0	17	.....	
3	RB	12¼	1431	2854	1423	18	79.05	
4	RB	12¼	2854	3661	807	15	53.80	
5	RB	12¼	3661	4451	790	14½	54.48	
6	RB	12¼	4451	4965	514	15	34.27	
7	RB	12¼	4965	5562	597	15½	38.52	
8	RB	12¼	5562	5833	271	12	22.58	
9	RB	12¼	5833	6162	329	16	20.56	
10	RB	12¼	6162	6410	248	12	20.67	
11	RB	12¼	6410	6524	114	10½	10.86	
12	RB	12¼	6524	6670	146	12	12.17	
1	C	8½	6670	6720	50	8	6.25	
2	C	8½	6720	6740	20	4	5.00	
3	C	8½	6740	6765	25	6	4.17	
13	RB	12¼	6765	6912	147	8	18.37	
14	RB	12¼	6912	7112	200	14½	13.79	
15	RB	12¼	7112	7260	148	12½	11.84	
16	RB	12¼	7260	7424	164	15½	10.58	
17	RB	12¼	7424	7500	76	8	9.50	
18	RB	12¼	7500	7617	117	13½	8.67	
19	RB	12¼	7617	7719	102	11½	8.87	
20	RB	12¼	7719	7831	112	11½	9.74	
21	RB	12¼	7831	7989	158	13½	11.70	
22	RB	12¼	7989	8085	96	13½	7.11	
23	RB	12¼	8085	8212	127	15½	8.19	
24	RB	12¼	8212	8321	109	16½	6.61	
25	RB	12¼	8321	8421	100	13	7.69	
26	RB	12¼	8421	8466	45	12	3.75	
27	RB	12¼	8466	8551	85	12	7.08	
28	RB	12¼	8551	8605	54	12	4.50	
29	RB	12¼	8605	8712	107	17½	6.11	
30	RB	12¼	8712	8774	62	14	4.43	
31	RB	12¼	8774	8842	68	15½	4.39	
32	RB	12¼	8842	8918	76	16½	4.61	
33	RB	12¼	8918	9020	102	14	7.29	
34	RB	12¼	9020	9079	59	11½	5.13	
35	RB	12¼	9079	9154	75	12	6.25	
36	RB	12¼	9154	9182	28	8	3.50	
37	RB	12¼	9182	9223	41	12	3.42	
38	RB	12¼	9223	9264	41	10½	3.90	
39	RB	12¼	9264	9334	70	11	6.36	
40	RB	12¼	9334	9387	53	11	4.82	
41	RB	12¼	9387	9439	52	10½	4.95	
42	RB	12¼	9439	9495	56	10½	5.33	
43	RB	12¼	9495	9540	45	10½	4.29	
44	RB	12¼	9540	9587	47	10½	4.48	
45	BR	12¼	9587	9619	32	10	3.20	
46	RB	12¼	9619	9648	29	9	3.22	
47	RB	12¼	9648	9679	31	8½	3.65	
48	RB	12¼	9679	9704	25	8	3.13	
49	RB	12¼	9704	9716	12	6½	1.85	
50	RB	12¼	9716	9761	45	12	3.75	
51	RB	12¼	9761	9791	30	11	2.73	
52	RB	12¼	9791	9824	33	10½	3.14	
53	RB	12¼	9824	9857	33	11	3.00	
54	RB	12¼	9857	9876	19	8	2.36	
55	RB	12¼	9876	9902	26	9	2.89	
56	RB	12¼	9902	9914	12	7	1.71	
57	RB	12¼	9914	9932	18	8	2.25	
58	RB	12¼	9932	9946	14	7½	1.87	
59	RB	12¼	9946	9965	19	8½	2.24	
60	RB	12¼	9965	9982	17	7¾	2.19	
61	RB	12¼	9982	9990	8	5½	1.45	
62	RB	12¼	9990	9996	6	4½	1.33	
63	RB	12¼	9996	10,003	7	4½	1.55	
64	RB	12¼	10,003	10,010	7	3½	2.00	
65	RB	12¼	10,010	10,020	10	6	1.67	
66	RB	12¼	10,020	10,029	9	4	2.25	
67	RB	12¼	10,029	10,074	45	9½	4.74	
68	RB	12¼	10,074	10,111	37	8½	4.35	
69	RB	12¼	10 111	10,161	50	9	5.56	
70	RB	12¼	10,161	10,243	82	9½	8.63	
71	RB	12¼	10,243	10,306	63	9½	6.63	
72	RB	12¼	10,306	10,329	23	10	2.30	
73	RB	12¼	10,329	10,342	13	7	1.86	
74	RB	12¼	10,342	10,348	6	6¼	.96	
75	RB	12¼	10,348	10,365	17	6½	2.62	
76	RB	12¼	10,365	10,397	32	10	3.20	
77	RB	12¼	10,397	10,423	26	9½	2.74	
78	RB	12¼	10,423	10,439	16	6¾	2.37	
79	RB	12¼	10,439	10,458	19	8½	2.24	
80	RB	12¼	10,458	10,469	11	6	1.83	
81	RB	12¼	10,469	10,499	30	8	3.75	
82	RB	12¼	10,499	10,546	47	13¼	3.55	
83	RB	12¼	10,546	10,559	13	7	1.86	
84	RB	12¼	10,559	10,597	38	12½	3.04	
85	RB	12¼	10,597	10,631	34	11½	2.96	
86	RB	12¼	10,631	10,654	23	9½	2.42	
87	RB	12¼	10,654	10,673	19	10½	1.81	
88	RB	12¼	10,673	10,694	21	10	2.10	
89	RB	12¼	10,694	10,718	24	10½	2.29	
90	RB	12¼	10,718	10,738	20	10½	1.90	
91	RB	12¼	10,738	10,754	16	9	1.78	
92	RB	12¼	10,754	10,772	18	9	2.00	
93	RB	12¼	10,772	10,796	24	9½	2.53	
94	RB	12¼	10,796	10,824	28	8½	3.29	
95	RB	12¼	10,824	10,846	22	9¼	2.38	
96	RB	12¼	10,846	10,882	36	9	4.00	
97	RB	12¼	10,882	10,905	23	9½	2.42	
98	RB	12¼	10,905	10,928	23	10	2.30	
199	RB	12¼	10,928	10,947	19	7	2.71	
100	RM	12¼	9119	10,947	Reaming			
101	RM	12¼	7900	8636	Reaming			
102	RM	12¼	8638	10,947	Reaming			
103	RB	8⅜	10,947	10,950	3	3	1.00	
104	RB	8⅜	10,950	10,955	5	5	1.00	
1	DB	8¼	10,955	10,956	1	3	.33	
2	DB	8¼	10,956	10,957	1	5	.20	
105	RB	8⅜	10,957	10,970	13	8	1.63	
106	RB	8⅜	10,970	10,979	9	8	1.13	
107	RB	8⅜	10,979	10,986	7	7½	.93	
108	RB	8⅜	10,986	10,993	7	9	.78	
3	DB	8¼	10,993	11,099	106	113	.....	
1	DC	8¼	11,099	11,128	29	25½	.....	
3	R-DB	8¼	11,128	11,223	95	116½	.88	Compl. 201′—229½ Hrs.
4	DB	8¼	11,223	11,280	57	71	.....	
1	R-DC	8¼	11,280	11,306	26	26½	.....	
4	R-DB	8¼	11,306	11,334	28	39½	.....	
5	DB	8¼	11,334	11,415	81	93	.87	
4	R-DB	8¼	11,415	11,538	123	82½	.....	
1	R-DC	8¼	11,538	11,596	58	20½	.....	
4	R-DB	8¼	11,596	12,020	424	214	1.55	Compl. 632′—407 Hrs.
6	DB	8¼	12,020	12,274	254	126	.....	
1	R-DC	8¼	12,274	12,288	14	17½	.....	
7	DB	8¼	12,288	12,444	156	129½	.....	
8	DB	8¼	12,444	12,947	503	386½	.....	
109	RB	8¼	12,947	12,952	5	3½	1.43	
8	R-DB	8¼	12,952	13,011	59	67	1.24	Compl. 562′—453½ Hrs.
9	DB	8¼	13,011	13,160	149	170¼	.....	
10	DB	8¼	13,160	13,431	271	198¼	.....	
11	DB	8¼	13,431	13,497	66	50¾	.....	
1	R-DB	8¼	13,497	13,531	34	18	.....	
11	R-DB	8¼	13,531	13,670	139	148¾	.....	
1	R-DC	8¼	13,670	13,685	15	17	.....	
11	R-DB	8¼	13,685	13,768	83	110¾	.93	Compl. 388′—310¼ Hrs.
12	DB	8¼	13,768	13,818	50	58½	.....	
110	RB	8¼	13,818	13,832	14	11	1.27	
12	R-DB	8¼	13,832	13,877	45	55½	.83	Compl. 95′—114 Hrs.
1	R-DC	8¼	13,877	13,963	86	69½	.....	
111	RB	8¼	13,963	13,972	9	10½	.86	
1	R-DC	8¼	13,972	13,990	18	24¾	.....	
112	RB	8¼	13,990	13,994	4	5½	.....	
1	R-DC	8¼	13,994	14,861	867	639¾	1.34	Compl. 1147′—859 Hrs.
13	DB	8¼	14,861	14,947	86	95	.....	
2	DC	8¼	14,947	14,974	27	35½	.....	
113	RB	8¼	14,974	14,986	12	7½	1.60	
2	R-DC	8¼	14,986	15,723	737	747	.98	Compl. 764′—782½ Hrs.
13	R-DB	8¼	15,723	15,765	42	55	.....	
3	DC	8¼	15,765	15,794	29	45½	.....	
4	DC	8¼	15,794	15,848	54	65½	.....	
3	R-DC	8¼	15,848	15,902	54	48	.....	
4	R-DC	8¼	15,902	15,956	54	27½	.....	
3	R-DC	8¼	15,956	16,010	54	36½	.....	
4	R-DC	8¼	16,010	16,061	51	54½	.....	
3	R-DC	8¼	16,061	16,115	54	39¼	.....	
4	R-DC	8¼	16,115	16,169	54	42	.....	
3	R-DC	8¼	16,169	16,223	54	30½	.....	
4	R-DC	8¼	16,223	16,227	54	41½	.....	
3	R-DC	8¼	16,227	16,331	54	28¾	.....	
112	R-RB	8¼	16,331	16,333	2	1	.92	Compl. 6′—6½ Hrs.
4	R-DC	8¼	16,333	16,387	54	30¼	.....	
3	R-DC	8¼	16,387	16,441	54	27	1.38	Compl. 353′—255½ Hrs.
4	R-DC	8¼	16,441	16,495	54	30	1.29	Compl. 375′—291¼ Hrs.
5	S-DC	8¼	16,426	16,460	34	24	.....	
114	CO-RB	7⅞	16,460	16,460	0	.....	.....	
6	DC	8¼	16,460	16,460	0	.....	.....	Outer core barrel broke off
7	DC	8¼	16,460	16,537	77	34¾	.....	
8	DC	8¼	16,537	16,621	84	38	.....	
7	R-DC	8¼	16,621	16,650	29	14	.....	
8	R-DC	8¼	16,650	16,678	28	14½	.....	
7	R-DC	8¼	16,678	16,706	28	13½	.....	
8	R-DC	8¼	16,706	16,734	28	14	.....	
7	R-DC	8¼	16,734	16,760	26	15	.....	
8	R-DC	8¼	16,760	16,818	58	30	.....	
13	R-DB	8¼	16,818	16,876	58	41½	.97	Compl. 186′—191½ Hrs.
7	R-DC	8¼	16,876	16,934	58	21½	.....	
8	R-DC	8¼	16,934	16,990	56	29¼	.....	
7	R-DC	8¼	16,990	17,046	56	26	.....	
8	R-DC	8¼	17,046	17,102	56	26½	.....	
7	R-DC	8¼	17,102	17,136	34	26	2.04	Compl. 308′—150¾ Hrs.
9	DC	8¼	17,136	17,192	56	61½	.....	
10	DC	8¼	17,192	17,248	56	48¾	.....	
9	R-DC	8¼	17,248	17,304	56	40	.....	
115	Hard Metal Special Drlg. Bit	8¼	17,304	17,308	4	8	.50	
10	R-DC	8¼	17,308	17,364	56	36¾	.....	
9	R-DC	8¼	17,364	17,392	28	28¾	.....	
10	R-DC	8¼	17,392	17,448	56	53	.....	
9	R-DC	8¼	17,448	17,487	39	47¼	.....	
10	R-DC	8¼	17,487	17,523	36	32¼	.....	
9	R-DC	8¼	17,523	17,540	17	19¼	.....	
10	R-DC	8¼	17,540	17,553	13	22½	.....	
9	R-DC	8¼	17,553	17,566	13	19	.....	
8	R-DC	8¼	17,566	17,575	9	15½	.....	
10	R-DC	8¼	17,575	17,601	26	37½	.....	
9	R-DC	8¼	17,601	17,612	11	22	.....	
14	DB	8¼	17,612	17,761	149	158¾	.94	
10	R-DC	8¼	17,761	17,777	16	21¼	.....	
9	R-DC	8¼	17,777	17,802	25	31¾	.....	
10	R-DC	8¼	17,802	17,838	36	52¼	.....	
15	DB	8¼	17,838	17,926	88	92¾	.95	
10	R-DC	8¼	17,926	18,038	112	106	.....	
9	R-DC	8¼	18,038	18,094	56	48¼	.....	
10	R-DC	8¼	18,094	18,150	56	48	.....	
9	R-DC	8¼	18,150	18,206	56	53	.....	
16	DB	8¼	18,206	18,286	80	110½	.....	
9	R-DC	8¼	18,286	18,342	56	68¾	.72	
16	R-DC	8¼	18,342	18,445	103	123¼	.78	Compl. 183′—233¾ Hrs.
10	R-DC	8¼	18,445	18,501	56	53¼	.....	
9	R-DC	8¼	18,501	18,557	56	48½	.....	
10	R-DC	8¼	18,557	18,613	56	42½	.....	
9	R-DC	8¼	18,613	18,669	56	39¼	.....	
10	R-DC	8¼	18,669	18,725	56	33¾	.....	
9	R-DC	8¼	18,725	18,781	56	31¾	.....	
10	R-DC	8¼	18,781	18,837	56	43¼	1.09	Compl. 687′—631 Hrs.

CONTINUED

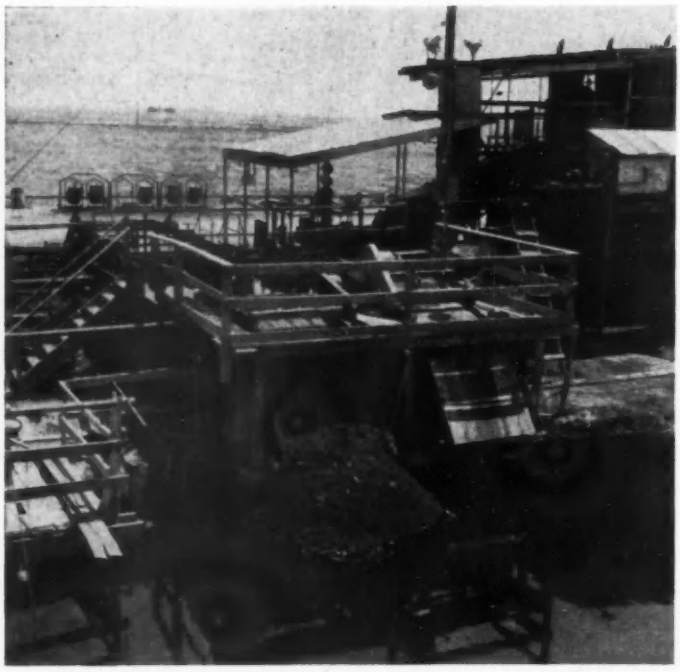
UNIVERSITY OF MICHIGAN LIBRARIES

Bit No.	Type Bit	Size	Depth On	Depth Off	Total Feet	Hours	Av. Ft.	Explanation
9	R-DC	8¼	18,837	18,866	29	31		
8	R-DC	8¼	18,866	18,889	23	28½		
17	DB	8¼	18,889	19,049	160	96¼	1.66	
9	R-DC	8¼	19,049	19,105	56	45	1.05	Compl. 666′—634¼ Hrs.
8	R-DC	8¼	19,105	19,161	56	43¼		
11	DC	8¼	19,161	19,189	28	41		
12	DC	8¼	19,189	19,245	56	44½		
11	R-DC	8¼	19,245	19,301	56	42½		
18	DB	8¼	19,301	19,390	89	74¼	1.20	
12	R-DC	8¼	19,390	19,417	27	28	.....	
11	R-DC	8¼	19,417	19,473	56	47	.....	
12	R-DC	8¼	19,473	19,491	18	23	.....	
19	DB	8¼	19,491	19,686	195	168	1.16	
11	R-DC	8¼	19,686	19,742	56	54	1.04	Compl. 196′—184½ Hrs.
12	R-DC	8¼	19,742	19,798	56	63	.99	Compl. 157′—158½ Hrs.
20	DB	8¼	19,798	20,003	205	154½	1.33	
8	R-DC	8¼	20,003	20,035	32	26	1.23	Compl. 430′—265½ Hrs.
20	R-DB	8¼	20,035	20,133	98	82½	1.19	Compl. 303′—237 Hrs.
21	DB	8¼	20,133	20,323	190	182½	1.04	
22	DB	8¼	20,323	20,529	206	167	1.23	

hole drilled. The remainder of the formations drilled generally were very hard, compacted shales. Eighty-three core samples have been analyzed so far. Core loss, during all the diamond coring, amounted to something less than half of 1 percent.

Bit Data. For the most part, diamond bits stayed on bottom for remarkable lengths of time; some for as long as seven days. Total footage cut with any one bit (including re-runs) covered a wide range. One diamond core head bit, however, used at various times between 13,160 and 18,837 feet, accounted for 687 feet of hole. This footage was made during an over-all time on bottom of 631 hours, an average of 1.09 feet per hour rate of penetration. For a breakdown of bit footages, including footage rates, see Table 1.

Thus far, 153, bits and core bits have been used in drilling to present depth of 21,482 feet. These include, not counting reamers, 98 rock bits and 3 conventional core bits used in drilling hole to 10,947 feet where protective string was cemented; and 52 bits and core bits, all but a few being the 8¼-inch diamond core or diamond drilling bits.



SHALE SHAKERS and mud suction tanks in the background.

Oil-base type muds used . . .

Throughout the entire period, from spudding-in to present total depth of 21,482 feet, drilling mud has been under very carefully engineered and supervised control. From surface to the point where the 9⅝-inch string was cemented, water base clay mud was used. At that point, it was changed over to oil base type mud which has been used ever since.

Lower viscosity of the oil base mud decreased pump pressures; also, it was relatively unaffected by high bottom hole temperatures which, at 20,003 feet, after hole had been static for 28 hours, was 334°F. Near present bottom, flow line temperatures were ranging betwen 172° and 176° F.

At 20,000 feet, it was found that circulation could be broken with pump pressures of about 800 psi. While drilling at this depth, circulation pressures seldom were needed in excess of 1700 pounds. Between 10,955 and 13,818 feet, the oil base mud was weighted to 85 pounds per cubic foot (11.3 pounds per gallon).

However, at the latter depth a hot salt water flow of from 7 to 21 barrels per hour was encountered and mud weight had to be increased to 125 pounds per cubic foot (16.7 pounds per gallon).

But as the salt water flow was killed, circulation was lost, with mud going away at the rate of 90 barrels per hour. New mud was made up and equilibrium was regained by maintaining the mud at 118 pounds per cubic foot (15.8 pounds per gallon). It required 11,450 sacks of mud weighting material to recondition the mud system. Since that time a very careful watch has been maintained on mud weight for if the weight goes above 118 pounds, circulation is lost and if weight drops below 115 pounds, salt water enters the hole.

Stability of oil base mud under the high bottom hole temperatures (334° F. at 20,003 feet) and pressures existing at 21,482 feet, was demonstrated in the latter part of November, 1953, during one phase of the still-continuing fishing operations. With core barrel stuck on bottom and with top of the drill pipe fish at 12,016 feet, no circulation had been possible for several days following back-off of the upper part of the string. When, finally, the wash-over string was made up and run ,and contact was made with the drill pipe, circulation through the fish was broken at only 1100 psi pressure and was maintained freely thereafter.

CONTINUED

junk that old liner"

It's worth 35% at Mission

When Mission introduced Super-Service Liners with exclusive Satin Finish* in May, 1950, we provided the oil industry with **a better liner** in a competitive price range to match the long-life quality of Mission Pistons, Valves, Rods and Rod Packing.

Now, Mission has done it again! We can now provide you with reduced size, induction hardened **RENEWED LINERS with Satin Finish*** that will give new liner service at 35% less than new liner cost!

HERE'S ALL YOU DO: When your mud pump reduced size liners (see note) become worn and need replacing, just turn them in to your supply store.

HERE'S WHAT YOU GET: Your supply store will deliver to you a guaranteed Mission RENEWED Liner with Satin Finish* at 35% less than new liner cost. Mission RENEWED Liners are reworked both inside and out to new liner specifications.

HERE'S WHAT IT COSTS: Your old liner is worth 35% of the cost of a new Mission Liner of the same size. Thus, you get a guaranteed RENEWED MISSION LINER with SATIN FINISH* for only 65% of the cost of a new liner.

NOTE: There are a few makes of liners of special material that are not suitable for renewing.

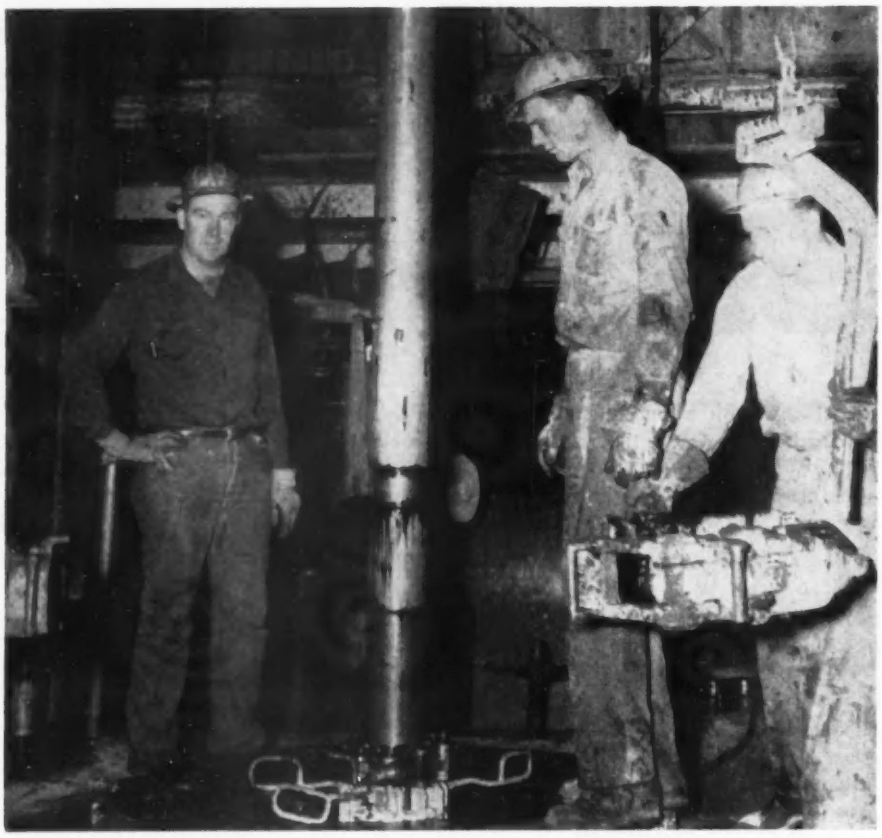
PLACE YOUR ORDERS TODAY AT YOUR SUPPLY STORE FOR MISSION RENEWED LINERS WITH SATIN FINISH*.

*Trade Mark Registered U. S. Patent Office.

MISSION
MANUFACTURING CO.

P. O. BOX 4209 • HOUSTON, TEXAS
Export Office: 30 Rockefeller Plaza, New York

* Trade Mark, Registered U. S. Patent Office.



BUMPER SAFETY JOINT shown just above rotary table is being run down on top of drill collars. The tool permits bumping down; also can be disconnected to permit recovery of drill pipe if bit becomes stuck.

Fishing jobs . . .

Prior to the present fishing job, the company had experienced only two that might be termed major fishing jobs, both of which were overcome successfully.

1. January, 1952—Thirteen days were lost due to fishing when hole was being reamed preparatory to running the 9⅝ protection string. Drill pipe was stuck at 7872 feet. Pipe was backed off one joint above the drill collars and run back in with a socket and jars. Jarring was unsuccessful so cutters were run and a 15-foot cut made on the 5-9/16 OD drill pipe.

A pack-off socket then was run in over the fish. After unsuccessfully trying to spot oil around the fish, attempts were made to back off the drill collars with string shots. These attempts, also, failed. The fish finally was recovered by fish washing over with 9⅝-inch wash-pipe and an 11¾-inch washover shoe, then fishing with socket and jars.

2. November, 1952—The second fishing job occurred the same year. At a total depth of 16,495 feet, pipe was stuck on bottom just as the driller was preparing to come out of the hole with a 54-foot-core.

Being unable to loosen it by jarring, the string was backed off at the safety joint, leaving 65.85 feet of fish in the hole, including the 8¼-inch diamond core bit, core barrel, sub and lower half of the safety joint. This left the top of the fish at 16,430 feet.

Jars were re-set and run in to engage the fish. With full circulation maintained, jarring was started first with 15-ton blows, then, in successive disengaging and re-setting of the jars, gradually increased to 50-ton blows. Actual jarring time was about 40 hours, although the operations were spread over a period of about four days. The fish could not be moved. At this point circulation was lost and regained only after reconditioning the mud with flake to bring it back to 116-pound weight. Drill pipe and collars then were backed off and prerarations made to side-track the fish.

Difficulty was experienced in trying to engage the top of the fish with the whipstock. Finally, on December 28, after several attempts at washover operations and unsuccessful runs with the whipstock, the combination core barrel and whipstock was engaged with sleeve and special clutch arrangement on the fish, and two feet of the hole was drilled off the whipstock. During the next three days, new hole had been cored to 16,426 feet.

At this point, further trouble developed. With total depth at 16,460 feet, drill pipe was stuck at 16,447 feet while coming out of the hole. The upper half of the safety joint and inner core barrel were backed off leaving the diamond core bit, outer barrel and lower half of the safety joint in the hole. The upper half of the safety joint, bumper sub and jars were made up and run back in, engaging the half safety joint on the top of the fish. The fish then was successfully bumped loose and recovered. A 7⅞-inch conventional rock bit with junk basket then was run but, while going in, a pin broke on the drill pipe, dropping slightly over 15,000 feet of drill pipe and tools to bottom, a distance of about 1300 feet. A socket was run in and drill pipe recovered, finding about 2280 feet of crooked drillpipe which had to be taken out of the string.

Finally after an elapsed time of 54 days, from sticking of core barrel to regaining of the previous depth of 16,495 feet, the 80 feet of fish comprising diamond core bit, core barrel, sub, safety joint and whipstock, were sidetracked successfully and drilling and coring was resumed.

3. August, 1953—Another fishing job occurred but it proved to be a minor one. At total depth of 20,579 feet, a drill pipe pin twisted off, leaving 5352 feet of drill pipe, drill collars and diamond drilling bit in the hole. With top of the fish at 15,227 feet, a socket was run in and the drill pipe freed and pulled. The 8¼-inch diamond drilling bit then was re-run and hole drilled to the present total depth of 21,482 feet.

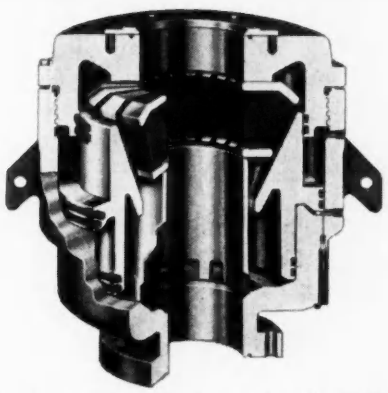
4. October 29, 1953—It was at this depth (21,482 feet), that drill pipe was stuck on bottom just as pipe was started out of the hole with a full core barrel.

Attempts were made to jar loose, but the jars could not be operated indicating the pipe was stuck farther up the hole. A free point indicator was run and pipe was found to be

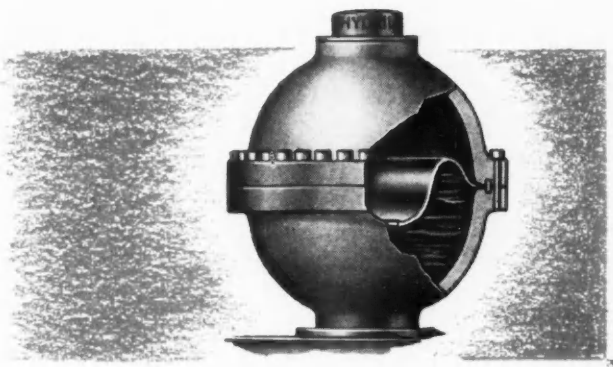
STOP BLOWOUTS INSTANTLY

with HYDRIL Positive Hydraulic Pressure!

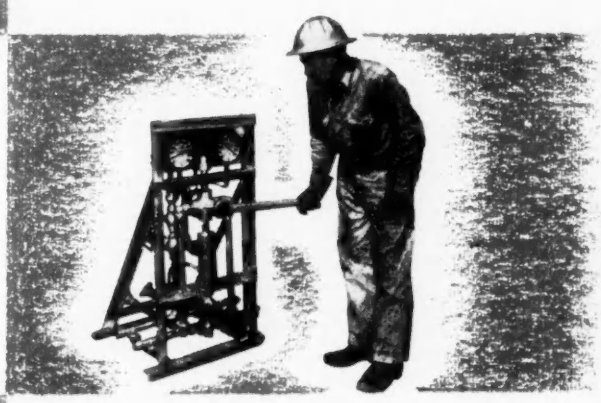
A single HYDRIL Automatic Pump Accumulator Unit maintains adequate pressure – instantly available – to operate your complete Blowout Preventer hookup. Here's how it works:



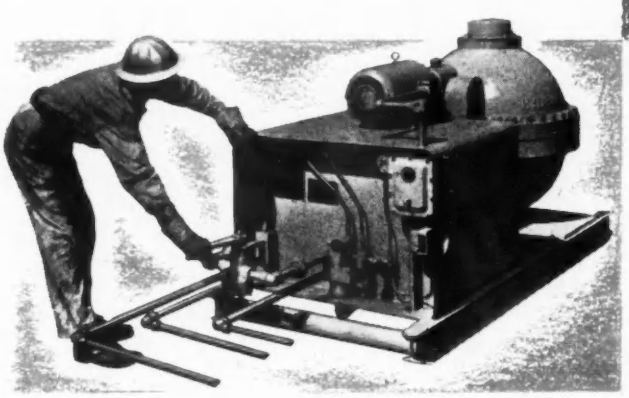
1 Hook up your single or double **HYDRIL "GK" BLOWOUT PREVENTER...**



2 to a **HYDRIL AUTOMATIC PUMP ACCUMULATOR UNIT** which stores hydraulic fluid under high pressure, keeping it always ready for instant closing of the Blowout Preventer...



3 then – in any emergency – pull a single lever at **DRILLER'S CONTROL STATION**



4 or at the **REMOTE CONTROL STATION** mounted on the Automatic Pump Accumulator Unit at a safe distance from the well. Controls are foolproof; regardless of which one is operated, the Blowout Preventer will always close...

***and* STRANGLE THE BLOWOUT *at the* START!**

HYDRIL COMPANY

General Offices: 714 W. Olympic Blvd., Los Angeles 15, Calif.
Factories at Houston, Texas; Youngstown, Ohio; Rochester, Pa.

Call or write the nearest Hydril Sales Office:

CALIFORNIA: Avenal, Bakersfield, Los Angeles, Ventura; **LOUISIANA**: Harvey, New Iberia; **OHIO**: Youngstown; **OKLAHOMA**: Tulsa; **PENNSYLVANIA**: Rochester; **TEXAS**: Corpus Christi, Dallas, Houston, Midland, Odessa; **WYOMING**: Casper; **CANADA**: Calgary

frozen at about 11,000 feet. The free section then was backed off with a string shot.

After unsuccessfully trying various means of attempting to loosen the fish, a 7⅝-inch washover string was made up on 4½-inch drill pipe and run in. Washing over and backing off, with string shots, proceeded for a time, with up to several joints being pulled each run. On Nov. 17, 1953, however, after some 1000 feet of pipe had been recovered, the washover string became stuck; the washover shoe being some 11 feet below the top of the original fish, which at that time was 12,016 feet.

After unsuccessfully trying to jar loose, a string shot was run. One joint of the washover pipe was backed off, leaving the top of the washover pipe fish at 11,766 feet. Work then was started on cutting up and recovering the stuck 7⅝-inch washover pipe and shoe. Making up a string equipped with an inside cutter, sections of the wash-over pipe, ranging in length from about 30 feet down to as little as 4½ feet, were recovered. Original length of the 7⅝-inch washover pipe was approximately 285 feet.

When finally the top of the drill pipe, the original fish, was reached, an inside cutter was run, the drill pipe was cut off below the point at which the original washover shoe was stuck and the cut-off piece recovered. The remaining section of washover pipe and most of the shoe then were recovered in several more cutting and pulling operations.

A new washover string then was made up, run in over the original drill pipe fish and about a joint and a half successfully recovered. At this point, however, some fragments remaining in the hole from the first washover pipe recovery operations started to interfere. These fragments prevented the washover shoe from getting down over the drill pipe fish. An impression block was run and, later, with the aid of magnetic fishing tools, these pieces of junk were removed. One piece which had given the most trouble because it lay across the open box of the top joint of the drill pipe fish, measured approximately 3 by 7 inches.

At this writing, with top of fish at 12,782 feet, washing-over and backing off of the fish is proceeding, with some encouragement derived from the fact that some sections of the fish appear to be relatively free in the hole, as shown by the recovery of some pieces, one of them about 700 feet in length, being recovered in a single run.

In all of the backing-off operations, free point indicator tools were run to determine the point at which pipe could be backed off and pulled from the hole.

Geology of the area . . .

Ohio's test is located on acreage leased from Kern County Land Company, in the south central portion of the 14-year-old Paloma field where 84 wells produce approximately 11,800 barrels per day from the Stevens Zone of Upper Miocene age at depths ranging from 10,000 to 11,950 feet, depending upon structural position. Crude oil production from this zone ranges from 35 to 43 gravity. The field also produces debutanized condensate, natural gasolines, butane and propane.

Eocene Objective. The company is prospecting for the Point of Rocks sand of Eocene age. Another possible objective is the Oceanic sand of Oligocene age, expected at some depth above the Point of Rocks. These two objective sands are prolific producing horizons in the Cymric and Belgian Anticline fields on the west side of the San Joaquin Valley, between 25 and 30 miles to the northwest of the Paloma field.

Further stimulating interest in these deep objectives was the discovery in April, 1952, of high gravity production in what is probably the equivalent of the Eocene Point of Rocks sandstone in the Wheler Ridge field. 15 miles southeast of the Paloma field.

Previous Record. Until recently, the deepest test drilled in this general area was a 16,246-foot well drilled by Standard Oil Company of California in 1945, located between the South Coles Levee and Elk Hills fields, and about eight miles northwest of the Ohio deep test. This well tested dry and was abandoned.

Nearby Find. A more recent discovery confirmed production in the Eocene when, in December, 1953, Richfield Oil Corporation completed its Coles Levee A 67-29 in the North Coles Levee field, about 10 miles northwest of the Ohio deep test. This discovery, establishing a new world's record producing depth, flowed, initially, 118 barrels per day of 43 gravity crude from a depth of 17,497-17,892 feet. Total depth is 17,895 feet. A short while later, however, production had dropped to 68 barrels daily of 57 degree condensate, with water cut of 16.5 percent. At last reports, the well was continuing to fall off, with prospects dim that the well would be a commercial producer.

Cost. The Ohio Oil Company estimated, at the time their well broke the previous 20,521-foot depth record established in 1949 by The Superior Oil Company in Wyoming, that operation of the company-owned rotary rig at Paloma cost from $1600 to $2000 per day. Up to that time, the estimated cost of drilling and testing had amounted to more than $1,300,000.

A generalized stratigraphic column shows the hole was in Recent

It's Easy to Get Hurt!

The Accident: Roughneck was climbing derrick ladder with tools in one hand. He fell and was seriously injured.

Recommendation: Use both hands in climbing a ladder. Upon reaching the point where work is to be done, signal for a fellow crewman to run up the tools with the catline. When retrieving tools from the catline, be ready to fasten them onto the body or rig. If it is absolutely necessary to climb with tools, fasten them securely to the body in such a way that they cannot catch onto the derrick.

OUR GUIDEBOOK TO SOUND GROWTH

Quality

The Continental Supply Company has ached its enviable position in the field of equip- ent and supply distribution because of a simple, asic reason . . . a close adherence to offering only uality products through dependable service.

We are proud of the outstanding manu- facturers we represent in the Oil Country. No sup- plier can offer a more outstanding list than this:

- Black, Sivalls & Bryson, Inc.
- Broderick & Bascom Rope Company
- Chain Belt Company
- Climax Engine & Pump Mfg. Co.
- Construction Machinery Company
- Crescent Plastics, Inc. (X-Trude Pipe)
- C. H. Dragert Company
- Emsco Manufacturing Company
- Farrar & Trefts, Inc.
- Fibercast Corporation
- Gardner-Denver Company
- Grinnell Company, Inc.
- General Electric Company
- Ladish Company
- The Lunkenheimer Company
- Clayton Mark & Company
- New Bedford Cordage Company
- New York Belting & Packing Company
- Rockwell Manufacturing Company
- George D. Roper Corporation
- Socony Paint Products Company
- Stockham Valves & Fittings Co.
- Technical Oil Tool Corp., Ltd.
- Walworth Company
- Westinghouse Electric Corporation
- Youngstown Sheet & Tube Company

Service

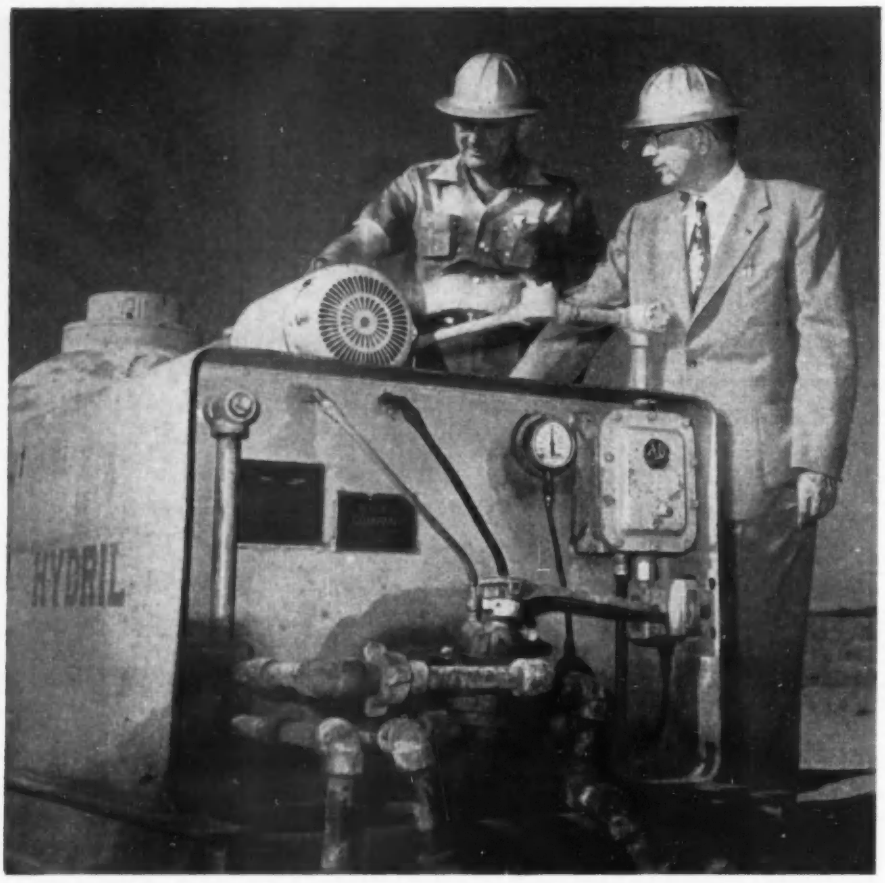
Quality products, although of the utmost importance, must be available when and where wanted to provide you maximum benefit. The strategically located Continental stores and offices make it possible to couple such quality and service for you.

You can count on Continental for both.

CONTINENTAL

SERVING THE OIL AND GAS INDUSTRIES

THE CONTINENTAL SUPPLY COMPANY
General Offices: DALLAS, TEXAS
Representatives in All Principal
Oil Fields of the World



INSPECTION. Division Production Superintendent William T. Kennedy and Division Manager George Sowards inspect automatic accumulator unit for blowout preventer.

'A' CREW. Top to bottom are Bill Gillette, driller; Jimmy Helton, derrickman; Alfred McKay, William McLaughlin and Leroy Finley, rotary helpers.

alluvium to 1000 feet; Tulare formation sands and clays of Pleistocene age, 1000-4200 feet; San Joaquin formation clays and sands of upper Pliocene age, from 4200-5700 feet, including the Paloma-Buena Vista Lake gas field producing sands; Etchegoin formation sands and claystones of lower Pliocene age from 5700-8800 feet; Antelope-Stevens formation shale and sands (including the Paloma oil field producing zone) of upper Miocene age from 8800-13,800 feet; and Temblor-Vaqueros formations, sands and shales, of middle and lower Miocene age from 13,800 feet to present depth.

Other Logs. In addition to the core and rate of penetration logs, seven various electric and radiation logs have been made to aid in evaluating the formations encountered.

They were as follows:

- Conventional electric resistivity and natural potential logs 1430 to 10,947 feet (in clay mud system)
- Mono-electrode resistivity and natural potential log 10,947 to 16,737 feet (in oil base mud system)
- Gamma ray log 8000 to 17,732 feet (in oil base mud system)
- Induction log 10,947 to 20,003 feet (in oil base mud system)
- Gamma ray log 11,000 to 20,003 feet (in oil base mud system)
- Neutron log 11,000 to 20,003 feet (in oil base mud system)
- Scratcher resistivity and natural potential log 10,947 to 19,049 feet (in oil base mud system)

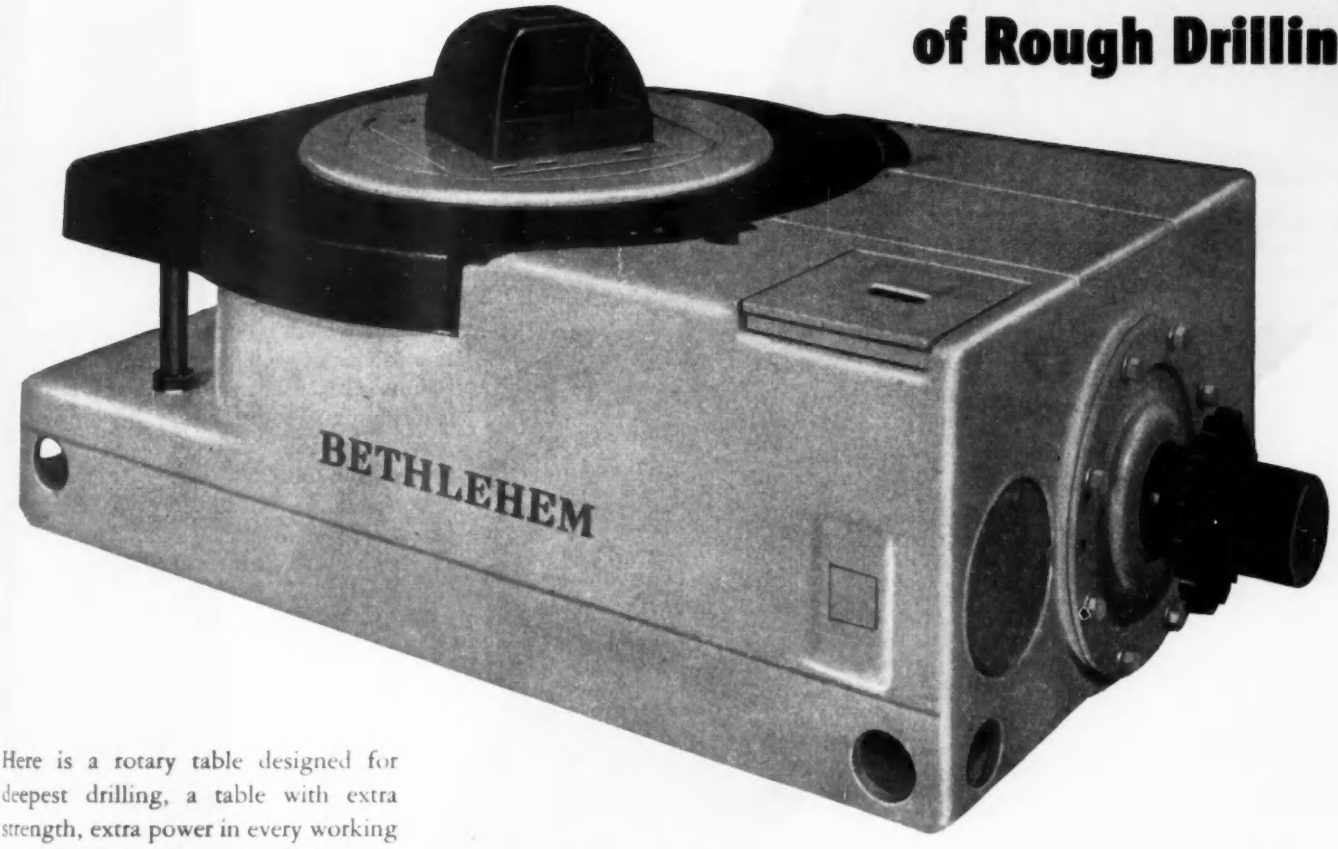
They did the job . . .

The foregoing story of drilling a hole to a depth of more than four miles would not be complete without mention of the people who participated in the 28-months-long operations. Much credit for the accomplishment goes to the high degree of coordination and skill displayed by those who planned, engineered, and supervised the project, and by those who worked on the derrick floor.

Three drilling crews of five men each, plus a relief crew, drilling foremen, drilling superintendents, petroleum engineers and geologists, head-

BETHLEHEM'S B-21-TA

The Rotary that can take the Shocks and Jolts of Rough Drilling



Here is a rotary table designed for deepest drilling, a table with extra strength, extra power in every working part. But strength isn't the whole story. The B-21-TA has something more. It is built to absorb the effects of shocks and vibration; built to iron out the jolts that sometimes occur during sudden take-up of load, changes of driving speed, etc.

What mechanical features account for this smoothness? How do they function as the table operates?

First, the wide-spaced, large-diameter pinion-shaft bearings provide rigidity of the shaft and maintain accurate alignment of pinion with table gear. Second, the self-aligning spherical roller bearing next to the sprocket absorbs thrust from the pinion and positions the shaft. Third, this large bearing easily handles any load that it is ever called upon to carry.

The table revolves on quiet ball bearings, which are oil-bath-lubricated from a central reservoir. Pinion and ring gear also receive a flood of oil from this reservoir. Pinion shaft bearings, on the other hand, are reached by a pressure-grease system. Efficient oil seals completely exclude mud from the bearings.

There are other features you'll like, too—for instance, the positive table lock, accessible even when the top of the rotary is flush with the floor. Why not let us go over all details with you? Say the word and a Bethlehem man will gladly supply full information.

BETHLEHEM STEEL

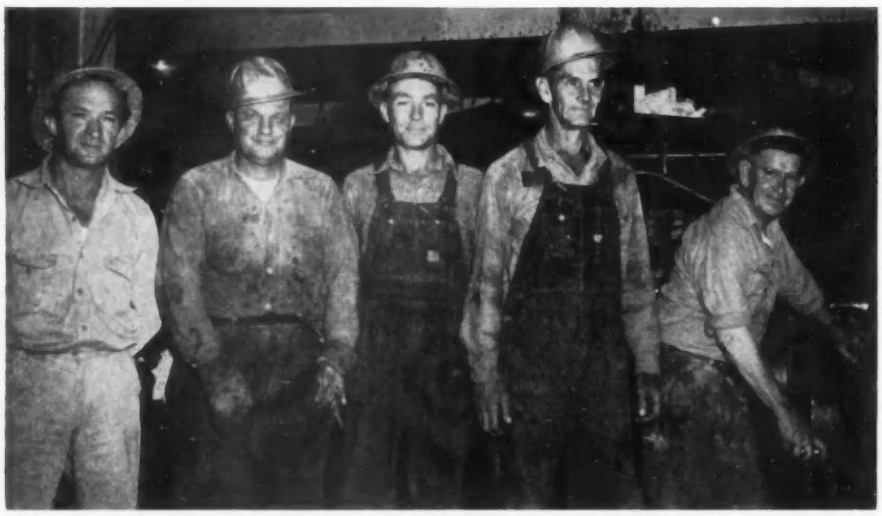
BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.

Export Distributor: Bethlehem Steel Export Corporation
25 Broadway, New York, N. Y.

'B' CREW. Left to right are Otis Roberson, rotary helper; S. R. Norton, rotary helper; V. R. Poehner, rotary helper; C. A. Craig, derrickman; W. T. White, driller.

'C' CREW. Left to right are W. H. Tudor, rotary helper; Ivan Seanor, mechanic; B. H. Doan, drilling superintendent; Frank Sherman, driller; Doyle Young (kneeling) and Carl Meade, rotary helpers, and Harold Patkoski, derrickman.



'D' CREW. Left to right are N. S. Woodside, rotary helper; J. B. Thorpe, rotary helper; D. O. Shrader, rotary helper; N. C. Tuttle, derrickman, and Fred (Paddy) Ryan, driller.

quartering out of Ohio's Bakersfield district office, have kept the big rotary operating around the clock.

Men who have played an important part in the drilling of the well include: John B. Sutherland, assistant to the manager of production; George Sowards, division manager; Robert M. Miller, assistant to the Los Angeles Division manager; W. T. Kennedy, division production superintendent; B. H. Doan, drilling superintendent; R. L. Durham, E. L. Fletcher and J. C. Weaver, rotary drilling foreman; A. F. Tokash, district production superintendent; R. W. Shoemaker, district geologist; Tom Wilson, geologist who "sat on the well," W. B. Emery II, district petroleum enginer; C. W. Stephens, division petroleum engineer; Don Everitts, Frank Rieber, W. C. Sheldon and other petroleum engineers; and former division geologist Glen Gariepy, who was recently transferred to Ohio's Shreveport Production Division as assistant division manager.

An Ohio Oil Company veteran who supervised the drilling of the well to about 17,000 feet was the late Ben Hollandsworth, former drilling superintendent.

Drilling crews were as follows:

A Crew: V. E. "Bill" Gillett, driller; J. J. Helton, derrickman; Leroy Finley, A. McKay and W. E. McLaughlin, rotary helpers. W. A. Harris, relief driller.

B Crew: W. T. White, driller; C. A. Craig, derrickman; Roy Baxter, Otis Roberson and V. R. Poehner, rotary helpers.

C Crew: Frank Sherman, driller; H. L. Patkoski, derrickman; B. L. Calhoun, D. F. Young and Carl Mead, rotary helpers.

D Crew: Fred (Paddy) Ryan, driller; N. C. Tuttle, derrickman; N. S. Woodside, D. O. Shrader, and J. B. Thorp, rotary helpers..

S. R. Norton is vacation relief man and H. Tudor is daylight extra man. Ivan G. Seanor is mechanic.

—The End.

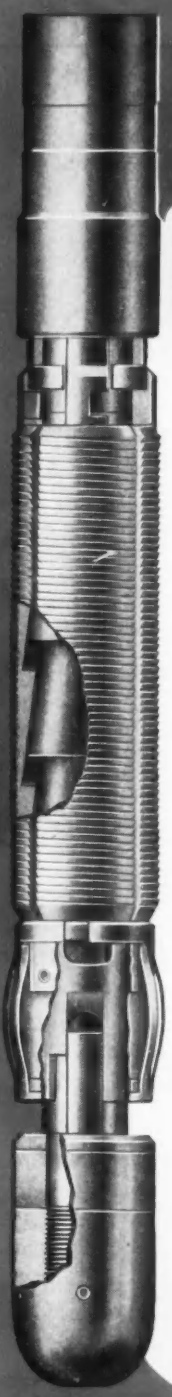
Fishing Report . . .

As of February 12, top of the drill pipe fish was at 14,009 feet. Washing-over operations were continuing, with length of sections being recovered averaging about 90 feet and with occasional sections measuring about 123 feet. Recovery of the drill pipe fish appears to be averaging slightly over 50 feet per day.

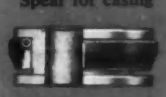
A Radical Departure From Conventional Spear Design

FULL CIRCLE TYPE BOWEN RELEASING SPEARS

Offer Many Outstanding Advantages



Full Circle Type Bowen Releasing Spear for casing



Safety Ring Pack-off

SECURE ENGAGEMENT—Full Circle Type Bowen Releasing Spears utilize novel Full Circle Slips that contact virtually the entire inner surface of a long section of the fish, and in addition, the entire inner circumference of the Full Circle Slips is backed by tapers on the spear body. Consequently, when a fish is engaged and upward pull is exerted, the expansion strain is spread so evenly over so much of the inner surface of the fish that there is no fish distortion. Comparisons show that this Spear has from 35% to 450% more useful slip engagement area than any other spear on the market today! Full Circle Spears insure the operator that there will be no loss of engagement regardless of the degree of the upward pull and regardless of the intensity of the jarring blows. On numerous actual jobs, in conjunction with hydraulic pulling tools and jars, pipe has been pulled and jarred in two below the Full Circle Type Bowen Releasing Spear with no distortion at the point of engagement.

VERSATILITY—All Full Circle Type Bowen Releasing Spears can be equipped to pack off the fish simply by removing the Safety Ring and by installing in its place a Safety Ring Pack-off. This one-piece pack-off attachment utilizes the circulation pressure to seal its rubber into a leak-proof fit against the inner walls of the fish. The radically different design of Full Circle Type Bowen Releasing Spears permits the use of other accessories which insure:

Alignment of the Spear with the fish.

Penetration of the fish to any desired depth.

Entrance of the Spear into a battered or sand-plugged fish.

Full Circle Type Bowen Releasing Spears are available for use with both right hand and left hand fishing strings.

Full Circle Type Bowen Releasing Spears are ideal to use with a Bowen Internal Cutter to perform cut and pull operations.

POSITIVE RELEASE—As their primary releasing mechanism, Full Circle Type Bowen Releasing Spears provide means for hanging and supporting the Full Circle Slips in their uppermost position relative to the spear body. When in this position, the Full Circle Slips cannot be expanded against the fish by the tapers on the spear body and the spear can be easily withdrawn from the fish. As a secondary releasing mechanism, left-hand wickers are cut on the Full Circle Slips to permit unscrewing from the fish. Full Circle Spears can be engaged with and released from a fish indefinitely without being withdrawn from the hole. The releasing mechanism is unaffected by excessive pulling strains, terrific jarring blows, and adverse well conditions.

SAFETY—All Full Circle Type Bowen Releasing Spears are engineered to provide greater tensile strengths than the tensile strengths of the pipe sizes that they engage. The Full Circle Slips are designed to collapse below the outside diameter of the Safety Ring or the Safety Ring Pack-off. This feature insures the Spear's ability to release from any fish that it has penetrated. The Full Circle Slips encompass so much of the inner area of the fish that it is virtually impossible for any junk to fall alongside and foul the mechanism of the Spear. Although each Full Circle Slip individually engages with and releases from the fish, a Unitizer is provided to make the slips work together in the event that a misshapen fish is encountered.

Available in tubing and drill pipe sizes.

ECONOMY—Because Full Circle Spears do not distort the fish, there is no movement under strain of the spear within the fish and the Full Circle Slips can be subjected to great pulling and jarring strains with no wear whatever. Pipe and liners salvaged by Full Circle Spears are more usable because they are neither split nor distorted. Another time-saving feature is the fact that slips can be changed without removing the Nut from the Body.

Write for descriptive literature

SR BOWEN CO

MAIN OFFICE AND PLANT:
11008 SOUTH NORWALK BOULEVARD
SANTA FE SPRINGS, CALIFORNIA
EXPORT OFFICE:
30 ROCKEFELLER PLAZA
NEW YORK CITY, NEW YORK
EXPORT REPRESENTATIVE: VAL R. WITTICH, JR.

How to do it

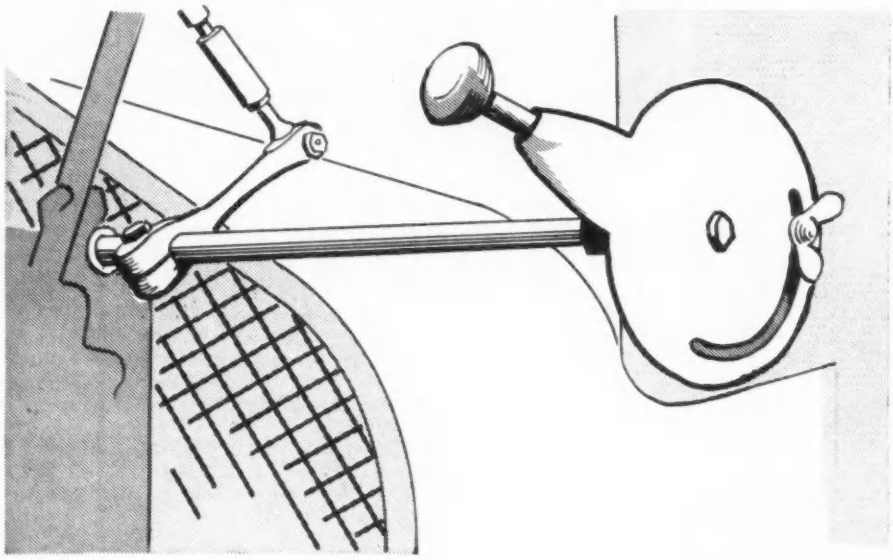
DRILLING HINTS

Large Diameter Conduit Made of Welded Drums

In areas where drilling water is scarce or expensive, and it is necessary to recover as much as possible from the waste sump, time and trouble can be avoided by using an overflow conduit of as large a diameter as possible. One operator has found it expedient to cut the ends out of several 55-gallon drums and weld them together to form a large-diameter conduit. By so doing, he eliminates the problems usually attendant with ordinary pipe, such as frequent clogging by weeds, lunch papers, and wind-blown trash usually found floating on the surface of the water. Such clogging, in turn,

often leads to over-flowing or channelling alongside the pipe, causing a general break-through of the waste sump; carrying with the water much undesired waste mud and cuttings directly into the circulating mud pits.

The large diameter afforded by the drums usually permits smaller trash items to come on through instead of stopping up the conduit; also allows partial flow even if a large tumbleweed should temporarily lodge against the opening and remain there until removed. The unit is inexpensive and light enough that one man can install it, or tilt it up or down as desired.



Throttle Device Regulates Engine Speeds

Miller & York, Drilling Contractors of Bakersfield, Calif., has developed a throttle device permitting regulated speed setting for mud pump engines. One side of a small auxiliary fuel tank supplies the support for the throttle "control panel" as shown in diagram. The support is a steel plate welded to side of tank.

The throttle adjusting device is mounted in the vertical plane. The shaft passes through a substantial bearing on the plate and to a second attached to the bedplate of the first engine. Linkage from this shaft is connected to a second rod which passes from the first engine to the second. This rod is fitted with two universal joints identical to those on a drive shaft of an automobile.

The regulating device is a circular sheet of steel attached to the shaft which may be locked by a wing nut as shown.

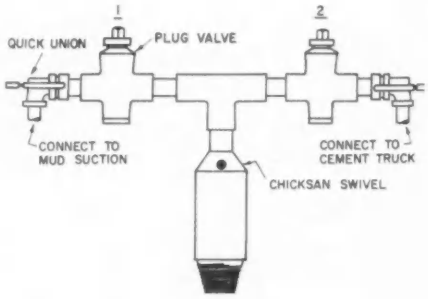
As a safety device, it permits the operator to make any adjustment of speed while standing in front of the "control panel," and making it unnecessary for him to pass through a narrow opening between the engines and the mud pump.

Homemade Connection Aids Fast Reverse Circulation

In Europe one contractor uses a homemade quick change pressure connection as a cement head, providing a fast way to reverse circulate.

After squeezing and releasing the cement retainer, plug valve 2 in the illustration is closed while plug valve 1 is opened.

Reverse circulation can be accomplished after the blowout preventers have been closed. This will, of course, depend on the top connection and the string being used.



H.C.SMITH
stands for

HIGHEST
CONSTRUCTION
STRENGTH

in 3-cutter rock bits

Heavier
Cutter
Sections

Harder
Cutting
Surfaces

Hydro-jet
Circulation
System

Highest-quality
Controlled
Steel

-every bit as good as the best

—plus, of course *all* the other features of H. C. Smith bit construction, such as ***All-Forged Parts, Triple Cutter Bearings*** and ***Precision-Cut Tool Joint Thread.*** These are the rock-bottom reasons for the reports from one oil field after the other, telling of faster footage and longer digging life with H. C. Smith 3-Cutter Bits.

H C Smith OIL TOOL CO.

GENERAL OFFICES, EXPORT OFFICES AND PLANT · COMPTON, CALIF.
Branches in All Principal Oil Centers in the United States and Canada

Get More Power

FEWER SHUT-DOWNS –
Use Less Fuel – with

SAND-BANUM

Pure Colloidal Concentrate for Steam Rigs.

FOR DIESEL RIGS AND TRUCKS
USE

SAND-BANUM SPECIAL
in the Handy Tablets.

In each case it's Farewell to rust and scale.

SAVE TIME, MONEY and TROUBLE

Stocked by
Leading Supply Houses

AMERICAN SAND-BANUM CO.
Established 1926
9 Rockefeller Plaza
New York 20, N.Y.

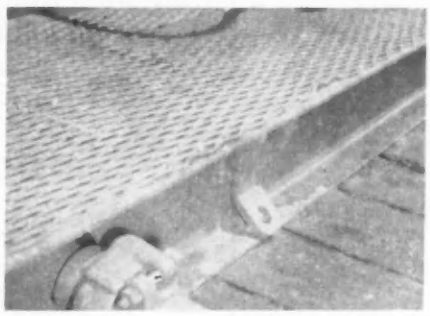
RUGGED— ACCURATE— EFFICIENT!

#3480
100 C.C.
CENTRIFUGE

You can maintain your required speed for the full period of the test with much less effort. Curtin centrifuges, proven world-wide, are heavy duty, rigidly constructed, and extremely simple in design. Illustrated bulletin, giving full details, available upon request.

W·H·CURTIN & CO.
HOUSTON . . . . NEW ORLEANS.

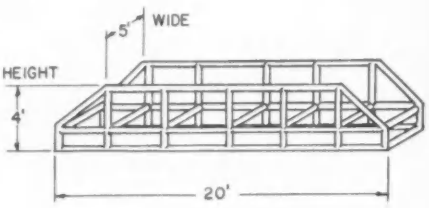
HINTS . . .



Collapsible Lifting Eyes Reduce Accident Hazards

Lifting eyes attached to skid-based pieces of equipment such as mud pumps and walkway sections often are hazards endangering the safety of crewmen working near them. In addition, such eyes, projecting above the general level of the base, frequently are bent or mashed down in the course of moving or handling of heavy equipment once it is set up at the well site.

One company has adopted the policy of installing a type of eye which, when it is released, falls down below the general working level, remaining there until the equipment again is picked up and moved. The eye is made of a short length of flat steel bar and is welded to a short pin, the latter swung between a pair of clips welded to the side of the I-beam base. Only slightly more fitting and welding is involved in this type of installation but this is compensated for by reduced hazards to personnel and repairs or replacements inherent in the conventional exposed eyes.



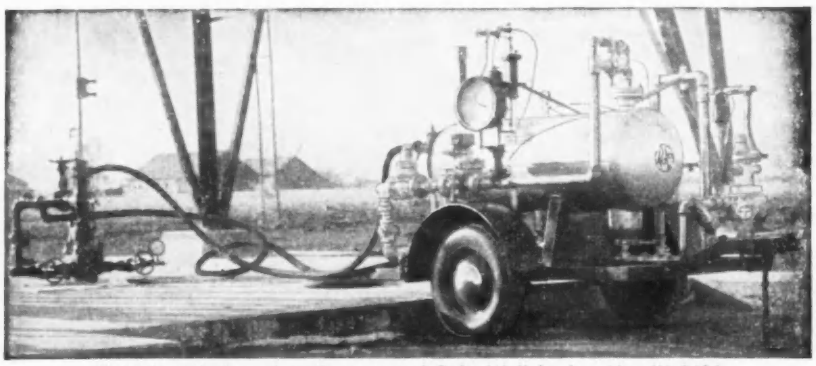
Rollers on Floor Braces Aid in Moving Pipe

One company operating in West Texas and New Mexico has expedited the handling of pipe on location by putting rollers on the floor braces of the moving rack.

The company has fabricated the rack from scrap three-inch pipe. The rollers are short joints of four-inch slipped over the three-inch floor braces.

ROLO WELLCHECKERS

PERMANENT AND PORTABLE SEPARATORS
FOR METERING OIL AND GAS

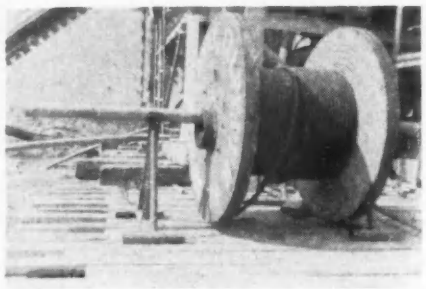


Field installation of trailer-mounted Rolo Wellchecker No. IH-2406

Made in various sizes to fit any operation, Rolo Wellcheckers are shipped completely piped and ready to operate. You need only connect inlet and outlet. In addition to oil meter, B. S. & W. sampler, gas run, orifice meter, fittings and all controls, free water knockout with meter can be furnished to separate and continuously remove free water from well fluid. See Composite Catalog or write for illustrated bulletin.

Crude Oil Metering Specialists

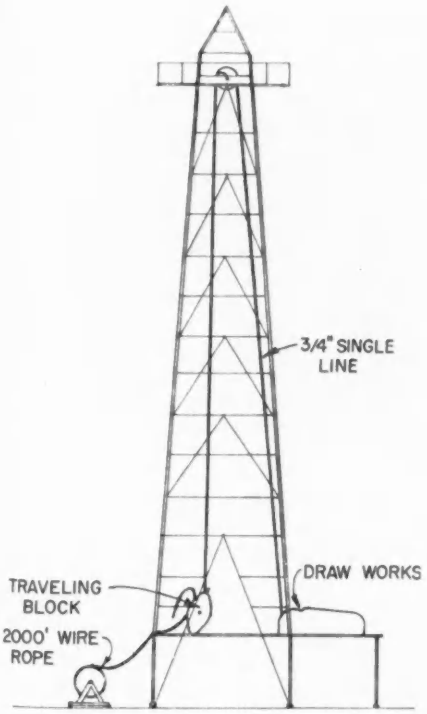
ROLO MANUFACTURING COMPANY
P. O. BOX 6763, HOUSTON 5, TEXAS
BRANCHES: Corpus Christi, Midland, Kilgore, Tulsa, New Orleans, Los Angeles, Bakersfield, Casper, Mt. Vernon, Illinois, Calgary (Alta.)
Petroleum Industry Consultants, Apartado 3992, Caracas, Venezuela.
EXPORT OFFICE: R. S. Stokvis & Sons, Inc., 17 Battery Place, New York, N. Y.



Wire Line Storage Frame Aids Better Maintenance

Spools of wire rope that can be handled easily facilitate string-up operations and encourage better crew maintenance.

The illustration shows a supporting frame that can be constructed from scrap material around any rig. Four-inch pipe is strong enough to support the spool and the frame parts are light enough to be handled easily. Two men can spool and inspect the line, leaving the remainder of the crew for other work. The spool of wire rope can be suspended on the supporting frame by a winch truck during rig-up operations.



Cable Twists Eliminated While Stringing Blocks

From Italy comes a suggestion that eliminates twists in the cable while stringing blocks. Before raising the traveling block with a single line fixed over the center sheave of the crown, crewmen can attach the new block-cable with a reserve of 50 feet to the traveling block.

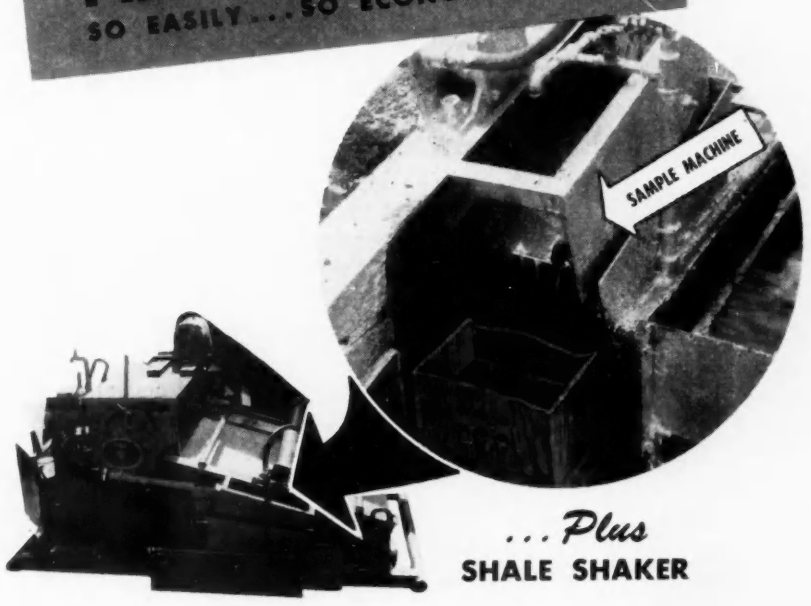
The driller then raises the traveling block close to the crown. The derrickmen insert the new cable through crown-end traveling block and connect the end of the line to the swivel of the traveling block. After slowly lowering the traveling block, the block cable may be fixed to the drum of the drawworks. By adopting such a method the twist in the cable is eliminated.

Tool Rack and Work Bench Are Easily Constructed

A South Texas company has made a device that serves as a tool rack and work bench. This device is made from three-inch pipe and two large pieces of one-fourth-inch sheet metal.

The base is constructed in a rectangular shape by welding together two two-foot lengths and two eight-foot lengths of pipe. In each corner of the base is welded an upright (two two-foot lengths and two six-foot lengths.) The uprights are then joined to make a frame for the metal sheet.

ONLY Thompson PROVIDES SAMPLES SO EASILY . . . SO ECONOMICALLY . . .



. . . Plus SHALE SHAKER

You can learn much about drilling formations, due to the famous Thompson Sample Machine, which works all the time the shale shaker is in operation. This amazing Sample Machine is recognized by drilling and geologic authorities throughout the industry as being of great value and extremely accurate. It is standard equipment on both the Shale Shaker (pictured above) and the famous Thompson Rotating Self-motivated Shale Separator. Let Thompson go to work for you. Thompson Shale Shakers and Shale Separators are ECONOMICAL IN OPERATION – PROVEN IN PERFORMANCE – SAVE DRILLING COSTS!

SOLD ONLY THROUGH SUPPLY STORES

Thompson TOOL CO.
IOWA PARK, TEXAS

Manufacturers of FAMOUS THOMPSON ROTATING SHALE SEPARATOR

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

Pens welded to the sheet serve as hangers for the tools.

A loading hook is also provided at the top to facilitate moving.

Two Mud Guns Keep Mud in Circulation

Use two mud guns to maintain the mud in a violent state of turbulence so that none of the heavier constituents can precipitate. Set the first near the pump suction flange and point it towards the opposite end of the vessel. This starts the mud moving rapidly,

but before it can lose its velocity, a booster jet picks up the fluid which adds to the turbulence. The second jet points roughly at 90 degrees from the first so that the stream strikes the other side of the tank and the maelstrom is maintained as long as it is necessary to keep a satisfactory mud in circulation.

LOCK THE DOOR *BEFORE* *THE HORSE IS STOLEN!*

KNOW when you lose mud...

with "*Pit-O-Graf*"

The Pit-O-Graf chart shows the instant lost circulation begins by recording a decrease in mud pit level. It enables action to be taken at once, while there is still time. An increase of mud in the pit, which is shown immediately on the chart, means gas or salt water. The crew has time to take action to avert a blowout. Pit-O-Graf is a completely automatic recording instrument which measures the mud pit level. With the recording unit right before the driller, he is aware at once of any increase or decrease in mud volume. Pit-O-Graf allows preventive action to be taken at once. You need Pit-O-Graf in lost circulation areas and for every wildcat.

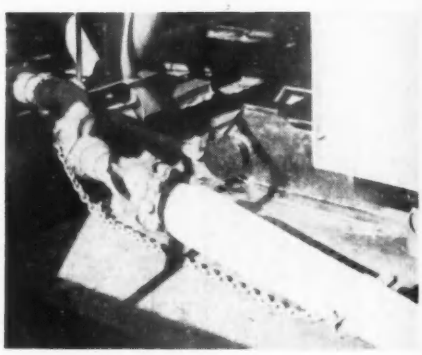
WARREN AUTOMATIC TOOL CO. HOUSTON

WARREN AUTOMATIC TOOL CO.

Manufacturers of Mud-O-Graf and Rig Runner.

Houston	Odessa	Lake Charles	New Iberia	Harvey
CHarter 4444	6-5861	6-2265	2-7131	Edison 3721

Export Representative: International Oil Equipment Co.
30 Rockefeller Plaza, New York City



Lubricated Swing Joint Prevents Hose Flexing

The problem of continuous flexing of a hydraulic hose was solved by using a lubricated swing joint. This fitting is placed at edge of rig substructure where the end of the mud line was laid in a more or less permanent position. This connection absorbs most of the shock of pulsation and allows the hose to swing within its normal arc without flexing the cords and fabric in its construction.

with both Electric Weld and Seamless Casing and Tubing

FOR shallow wells, medium wells, deep wells, you'll find casing and tubing by Republic that can do the job.

Electric Weld Casing and Tubing have been widely used by the oil and gas industries for the past twenty-five years in shallow and medium wells all over the world. They are manufactured in sizes 2⅜" to 13⅜", grades H-40 and J-55.

Republic Seamless Casing and Tubing are now being produced at our new plant on the Calumet River in Chicago, easily accessible for shipping to oil fields anywhere. The latest manufacturing techniques plus Republic's rigid quality control from ore to finished product assure seamless products second to none. Seamless sizes range from 2⅜" through 9⅝", grades J-55 through N-80.

When you order casing and tubing . . . for any depth . . . keep these two things in mind: you get Republic quality plus shipping facilities. And you can get both seamless and electric weld products from one source. For more information, call your nearest Republic Sales Office. Or write to:

For a quick picture trip through Republic's new Seamless Mill, write for this new 24-page booklet. Ask for No. ADV-595.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York, 17, N. Y.

REPUBLIC CASING AND TUBING
Electric Weld and Seamless

REPUBLIC STEEL

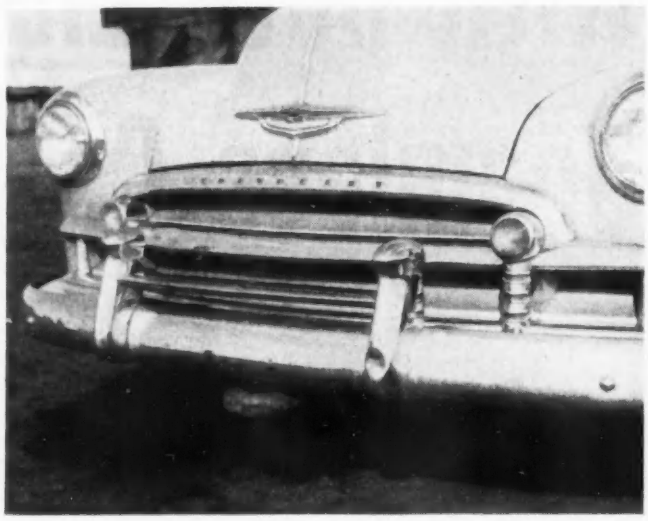
Other Republic Products include Line Pipe—Steel and Plastic Pipe—Carbon, Alloy and Stainless Steels—Studs, Bolts and Nuts—Heat Exchanger Tubes

Metal Spool Protects Excess Catline Rope

To protect excess catline rope a Gulf Coast contractor has built two metal discs, a metal cylinder and two-inch pipe.

The base is built in the shape of a "Y" from the two-inch pipe. The discs are welded to each end of the metal cylinder to form a spool. The spool can then be mounted on the base by inserting the pipe through holes cut in the metal discs.

Eye Installed on Car Aids Towing



The pusher of one company, in preparing for getting stuck in snow or mud, considers the work involved in installing a heavy towing eye on the front of his sedan a worth-while form of insurance. Ordinarily, when it is necessary to have another car, truck, or tractor tow a car out of the ditch, chain or cable is wrapped around any accessible point on the axle, bumper bracket, or even the bumper itself. Often such inexpertly-applied hitches result in bent or otherwise damaged parts of the front end, particularly if the towing driver takes up the slack with a jerk.

To avoid such damage, this pusher had a heavy one-inch round bar bent to form an eye and the two ends extended back to be tied in securely with the frame. Shown in the photograph, the eye projects only slightly forward of the bumper and does not disfigure the appearance of the front end of the vehicle. When needed, however, the towing eye will assure the driver of being pulled out safely, without damage to his car and usually in much shorter time than would be required with a temporary hitch.

FOR SWABBING

AUTO-RELEASE WIRE LINE STRIPPER

Finest in the field. King Strippers represent outstanding advances in design and construction that assure long life and maximum operating efficiency:

- POSITIVE LATCH will not release by accident or surge of pressure.
- SURE RELEASE MECHANISM operated by rope socket striking bottom of the stripper.
- NON-SPARKING MATERIALS minimize fire hazard.
- ROLLER WIRE LINE GUIDES on hardened steel pins.
- SIDE OPENINGS for inserting packing while line is in the hole.
- PACKING IS SELF-CENTERING; compression screws need not be evenly adjusted.

Export: R. S. STOKVIS & SONS
17 Battery Place, New York 4, N. Y.

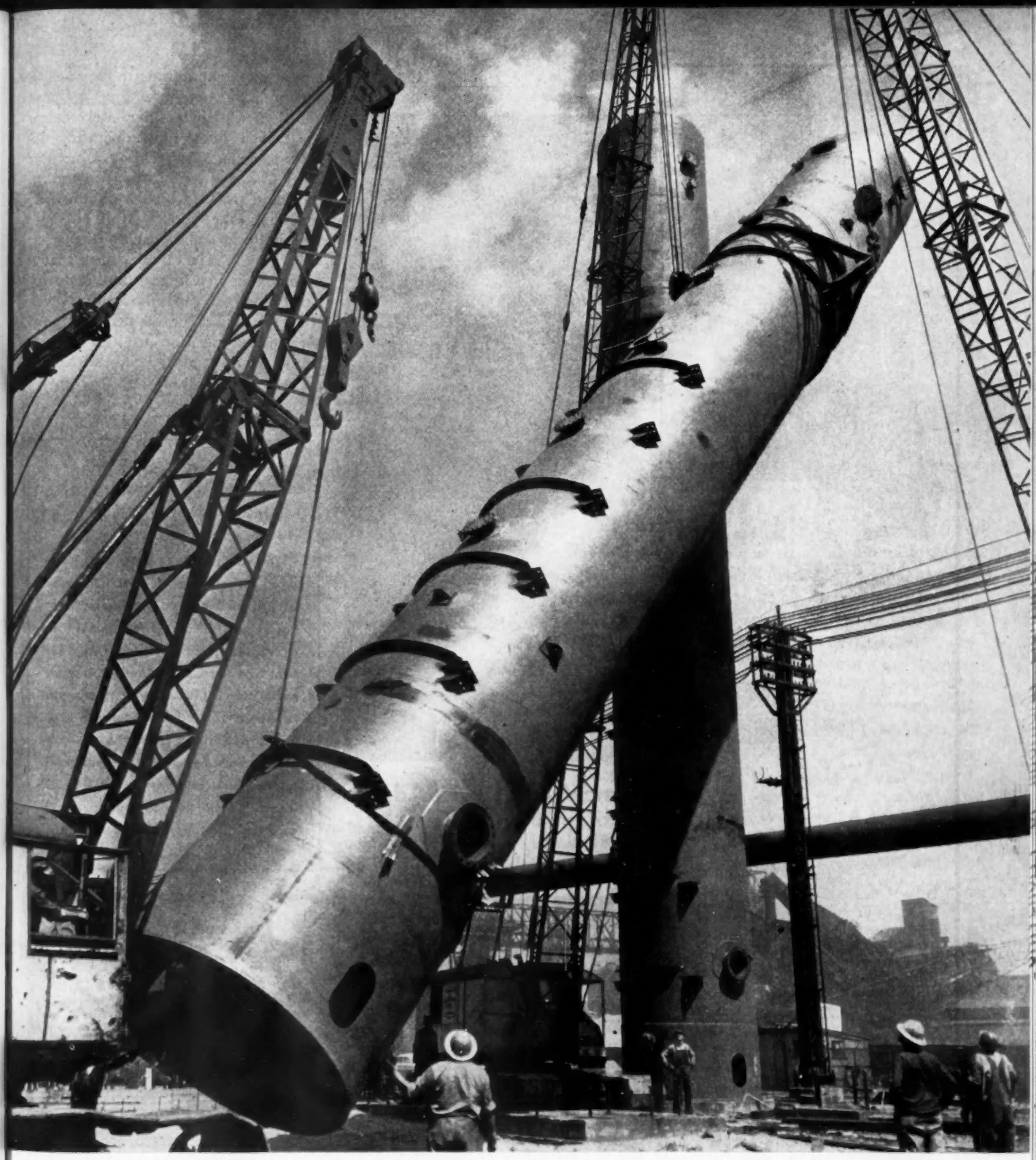
KING OIL TOOLS
210 TERMINAL ST. HOUSTON 20, TEXAS OSage 3-3421

you save when you log as you drill with Geograph!

Geograph always *points* the way to *increased efficiency* because it gives a detailed record of the time spent in each drilling operation! That's why you *save* when you log as you drill with Geograph!

GEOLOGRAPH
MECHANICAL WELL LOGGING SERVICE
P.O. Box 1291 • Oklahoma City 1, Okla.

Farmington, New Mex. • Liberal, Kan. • Oklahoma City, Okla. • Bakersfield, Cal. Abilene, Houston, Odessa, Lubbock and Wichita Falls, Tex. • Shreveport, and Baton Rouge, La. • Casper, Wyo. • Glendive, Mont. • Sterling, Colo. • Calgary and Edmonton, Alberta, Canada • Regina, Saskatchewan, Canada



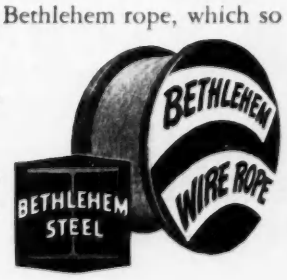
Wire Rope at Work—Here's a load that required deft manipulation by three cranes working as a team. The absorption tower being guided into place was 98 ft long, 11 ft in diameter, and weighed more than 33 tons.

For the lifting and placing of this big, cumbersome load, the cranes were rigged with Bethlehem wire rope, Purple Strand grade, in the 6 x 25 construction; sizes, ⅞-in. and ¾-in. A typical assignment for Bethlehem rope, which so capably handles the toughest lifting and hauling jobs in every kind of industry.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

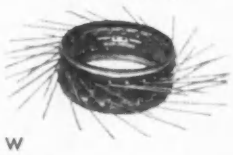


the FIRST scratcher

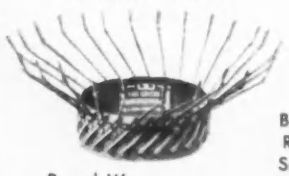
B and W Scratchers and Centralizers for a Good Cement Job.

B and W Wall Cleaning Guide

B and W Nu-Coil Scratcher



B and W Multi-Flex Scratcher



B and W Rotating Scratcher

B and W Latch-On Centralizer with the New Kon-Kave Bow

FREE.. DON'T DELAY WRITE FOR YOUR RULER TODAY

First in the Field...

For a Good Cement Job!

4365

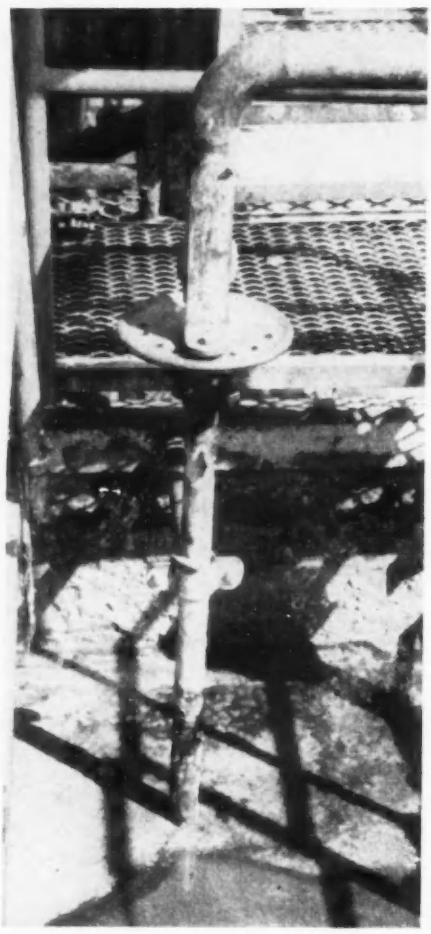
B and W Inc.

Well Completion Specialists

GULF COAST
P. O. Box 5266
Houston 12, Texas
Phone WE-6603

WEST COAST
3545 Cedar Avenue
Long Beach 7, Calif.
Long Beach 4-8366

HINTS . . .



Hand Wheel Device Adjusts Position of Mud Gun Jets

Adjusting the direction and position of the jets of the mud guns used for agitating the material in the tank is accomplished by attaching a hand wheel to the line immediately below the swivel. These hand operating devices are made by welding a circular sheet of heavy steel to the line and to the hand wheel, which is obtained by removing the spokes from a gate wheel. To lock the position of the jet, holes bored in the circular sheet match a hole made in a finger running downward from the pipe above the swivel. A clevis pin, or dowel, is inserted at the desired position to lock the jet firmly at the point where stirring is necessary.

How to Get Free Index of 1953 WORLD OIL

The complete editorial index covering all issues of WORLD OIL published during 1953 has been prepared and is bound separately in convenient pamphlet form. It will be sent free *to all subscribers* who write requesting copies. All you have to do is to refer to the Reader Service blue postcards (on Pages 281-282), fill in your name, company, position and address and add the words: "Send Index." Mail the postage prepaid card and the Index will be sent you.

Gotkool water cans and coolers

GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. Push-Button Faucet at slight additional cost.

KEEP PURE DRINKING WATER ALWAYS HANDY

GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.

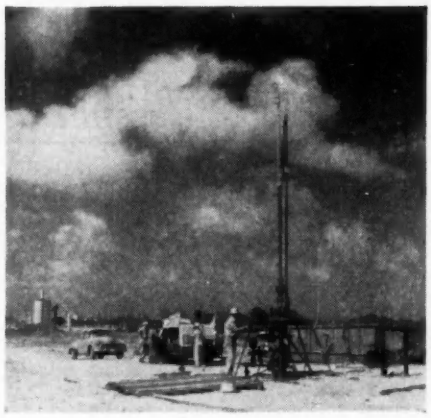
GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug-fitting, large, removable top, handy non-leaking push-button faucet. GOTT Water Cans for handy field use. Your supply store has them, get one today!

STANDARD OF THE OIL FIELDS
Insist on the Genuine

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

Horizons Unlimited . . .

Permanent-Type Well Completions Come of Age...



THE FIRST TIME you hear the words, "permanent-type well completion," something just doesn't click. To the veteran oil man, well completions just aren't permanent. You have to service the well, and this means pulling the tubing. But not so according to this new concept.

There was skepticism aplenty among those attending the 30th Annual API meeting in Los Angeles, November 14, 1950, when this idea was introduced for the first time. At the end of a paper titled, "Well Completion Practices" by T. A. Huber, T. O. Allen and G. F. Abendroth,* Humble Oil and Refining Company, only a few highlights of this revolutionary technique were mentioned. It was the engineer's approach toward improving completions for maximum recovery at lower costs.

Big feature of this new method whereby the name "permanent" was derived, explained Huber who presented the paper, lies in the fact that the tubing and well head are set only once in the life of the well. He also suggested that the casing be perforated by a gun that passed through the tubing and that all subsequent remedial work be done through the tubing with wire line tools. This idea was difficult to grasp just three years ago!

First Field Test. Little did that API audience suspect how real was this suggestion. Just a week earlier, the first field well had been perforated successfully with a new type gun, developed especially for this technique. This significant test took place November 8, 1950, in the Hoffman field of Southwest Texas. The perforator, only 1¾ inches in outside diameter and seven feet long, contained 35 power-packed shaped charges. It was lowered through and out the bottom of open-ended 2-inch tubing, and fired into 5½-inch casing. Penetration was sufficient to make an excellent producer. Feasibility of the technique was proven in field tests utilizing devices made by modifying available equipment. Next step was the development of standard tools and equipment involving close coordination between development engineers, manufacturers and service companies.

About 1000 Wells Set Up. Three years later, development continues at a fast pace as the technique gains momentum in field use. Not only has Humble, who pioneered the idea, used it, but others have as well. At this writing, it is estimated that between 900 and 1000 wells have been permanently completed. Workovers on these wells will total about 150. From 25 to 30 wells per month are being worked over and this number is increasing.

Savings Significant. In setting up nearly 1000 wells in this manner, from one to two days rig time have been saved in the initial completion. In recompleting many of these wells, it is possible to reduce workover costs from ⅓ to ⅔ that normally incurred by conventional workover methods.

Influence on Drilling. The impact of this idea on drilling will be as significant as it has been on production practices. Slim hole drilling as a cost-cutting practice, is not entirely satisfactory due to difficulty in working over these wells. Permanent-type well completions promise a practical solution in many areas to the problems of working over slim holes in which has been set casing as small as four inches in diameter! This is an approach to the often asked question: "Why set 5½-inch casing in a well that will produce its allowable through an ⅛-inch choke?" The answer to slim hole drilling may not be too far away.

Why a Special Field Report? Yes, the idea of permanently completing wells is no longer an engineer's drafting board dream. It has blossomed into one of the most promising production developments to come along in many years.

Because the editors of WORLD OIL feel that this idea will be of unlimited benefit to the industry, the entire Production Section of this issue has been devoted to a Special Field Report on the subject of permanent-type well completions. The information contained herein is not from one individual, one company or one paper, but is an extraction from many sources, listed at the end of this symposium. We have assembled under one cover as much practical information on this subject as possible. It is our sincere hope that this report will contribute to a better understanding and wider application of permanent-type well completions.

J. E. KASTROP, Production Editor.

* Now with Lyons, McCord & Logan, Shreveport, La.

WORLD OIL's special report on...

Permanent-Type Well Completions

Because of high interest in this new technique, and also because available information is scattered and incomplete, the editors of WORLD OIL, with the help of several specialists, have brought together under one cover a complete treatise on permanent-type well completions. Data have been extracted from published and unpublished papers, bulletins, interviews, talks and correspondence. This compilation also includes data on actual field wells which illustrate the practical aspects of this type completion. Much of this information is published for the first time, especially that section dealing with dual permanent completions.

To PERMANENTLY complete a well, in the practical sense, means that once the tubing and packer (if one is used) have been set and the well head assembly connected, they remain in place, undisturbed, during the productive life of the well. Perforating for initial completion in a new well is performed by a gun small enough to pass through the tubing. All subsequent workover operations are carried out through the tubing by means of wire line methods and tools. In essence, this is the principle of permanent-type well completions.

This new technique is predicated on the assumption that other factors which ordinarily would require removal of the tubing have been adequately resolved. Subsurface corrosion is among these problems. Modern treating methods have minimized corrosion troubles, for all practical purposes, except in unusual cases.

Primary application of permanent completions to date has been in cased holes. It may be applied in some openhole completions where a second productive zone exists behind the casing above the open hole. When equipped for a permanent completion, an open hole could be cemented off when depleted and the cased zone perforated without pulling the tubing. This new method also offers an advantage in open hole completions where sand fill-up is a problem. Washing out bottom fill-up is a simple operation when this completion idea is employed.

Where close control is desired in producing the reservoir, and particularly where more than one zone is present, it is essential that the well be cased through the productive sections. It will be noted in all the discussion to follow and in the cross-sectional diagrams, that casing extends through the producing interval and all zones which are to be produced.

Why a Permanent Well Completion. Impetus behind the development of a permanent-type completion system was not only that of lowering both initial completion costs and subsequent workover costs, but one of perhaps greater importance. How a well is completed may determine whether or not it is a commercial producer, or if it produces at all. Also, the manner in which the well is completed influences, in many instances, ultimate recovery.

Formation damage, particularly in low-pressure zones, has been responsible for many poor producers, or even abandoned wells. Since the completion of a well begins with penetration into the producing formation, it is essential that care be exercised to minimize reservoir damage that would impair flow into the well bore. Here again, tools and techniques developed for permanent completions eliminate or minimize formation damage.

Two Ways to Save. It has been estimated that completion expenses for the average well will run about 20 percent of total well costs. Further costs, ranging from 15 to 25 percent of the lease and well expenses, may be incurred during depletion of a reservoir.

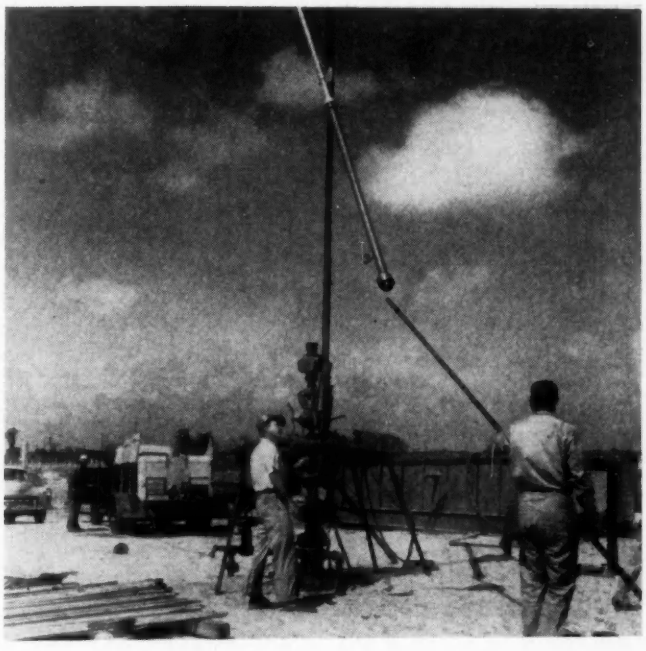
Where to find it . . .

How to Prepare the Well 172
- **Flowing well with a packer** 174
- **Pumping or flowing wells without packers** 178
- **Gas lift well** 182

Working Over Permanently Completed Wells 185
Washing Out Sand 186
Squeeze Cementing Data 190
Abnormal Pressure Wells 198
Use of the Plug Cutter 200
Dual Permanent Completions 203
How Much Can You Save? 208
What the Future Holds 210

Eight important steps in working over permanently completed wells . . .

1. Locator tool run in to establish wire line measurements with well bottom, end of tubing, hanger landing nipple.



2. Pulling tool attached to wire line jars is inserted into a lubricator prior to retrieving regular gas lift valve.

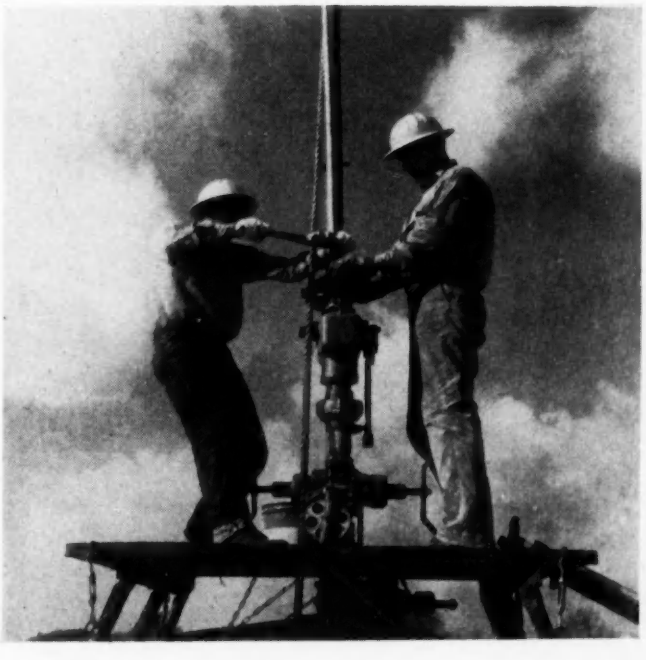
This amount is spent for subsurface reconditioning work, including mechanical repairs and workovers. These two items combined amount to a substantial cost figure which can be attributed to well completion practices. Here, then, lie two avenues in which savings can and have been affected.

Primary Advantages. There are four primary advantages offered by permanent-type well completions.

1. Experience in equipping several hundred wells in this manner indicates that from one to two days rig time has been saved during initial completions. This saving is made possible by taking advantage of the waiting-on-cement time to run tubing and nipple up the well head. The rig may be moved before the well is perforated with the tubing-type gun.

2. Recompletion and workover expenses have been reduced in some wells by as much as 75 percent! However, in routine operations, savings of

3. Retrievable gas lift valve is removed from pulling tool. A circulating dummy valve is run in lower mandrel only.



4. One-inch aluminum extension pipe is run into well after it is killed with salt water. Joints are run in by hand.

5. An extension hanger is attached to 1-inch aluminum pipe. Slotted steel plate supports pipe by API iron couplings.

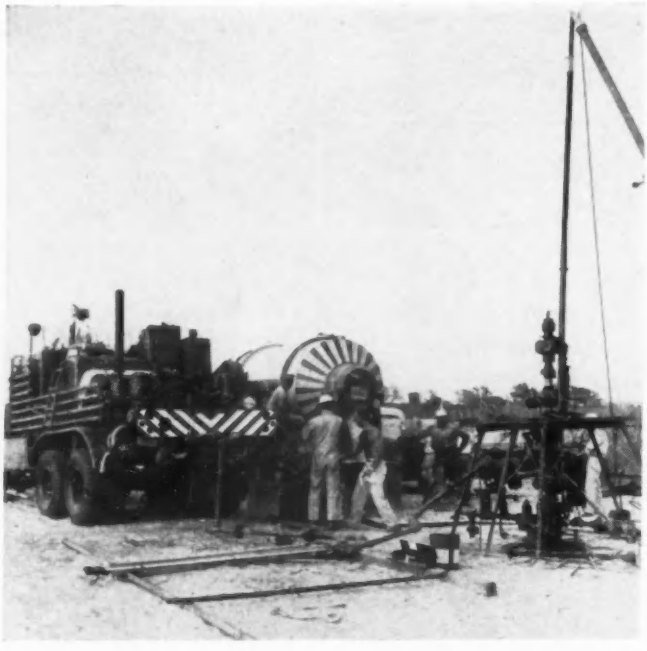
6. The extension hanger running tool with sealing prong is disconnected from wire line jars hanging out lubricator.

⅓ to ⅔ of normal recompletion charges may be expected when working over wells with wire line methods. Pipe hoisting equipment and drilling muds are not required, eliminating the need for a rig or pulling unit. All remedial work is performed with wire line equipment through the tubing.

Shut-in time for remedial work is minimized by using wire line workover methods. Permanently completed gas lift wells producing from 6500 feet have been killed with salt water, squeezed, perforated and jetted back on production in only three days at a cost of about $2500! In an 8000-foot Frio sand reservoir in Southwest Texas, three wells were reperforated in the conventional manner to increase production. Tubing was pulled and the standard type gun perforator run. Average cost per well was $4450. In the same field, five wells equipped with permanent completions were also reperforated, but with the tubing-type gun. Average cost was only $1160.

3. Formation damage is minimized through the use of salt water or lease oil to load the well during perforation operations. Danger of possible well blowout is eliminated completely since the christmas tree remains in place, and the well is under pressure control at all times.

Formation salt water taken from gun barrel tanks has given excellent



7. A bradenhead squeeze is applied by pumping into the flow wing valve on the wellhead. The casing valve is closed.

8. Retrievable gas lift valves are run in by use of a kick-over tool that spots them in the offset mandrel pockets.

NEW

Axelson 6′ stroke hydraulic pumping unit

The Axelson Model H-100 answers the need for a pumping unit that has low initial cost coupled with trouble-free operation. An almost constant oil flow is possible because the unit combines a fast downstroke with a slow upstroke, thus increasing the volumetric efficiency of the sub-surface pump. Axelson's hydraulic reversal valve (patent applied for) assures a gentle reversal action which is easy on sucker rods.

CHECK THESE FEATURES:

TRIPOD BASE allows spacing of the sub-surface pump by insertion of sub-couplings between the well and unit polished rod. One leg of the base is used for porting high pressure fluid, while a second leg carries discharge fluid from cylinder base back to the fluid reservoir. A very important feature of this mounting assures no contamination of the hydraulic fluid. A flange at the bottom of the tripod base forms the upper mating surface of a special Axelson casing head adapter. Adapters are available to fit any standard well head casing flange.

CYLINDER BASE may be called the "hub" of the unit. The unit tripod attaches to the bottom of the base, the cylinder into the top portion and the reverse valve assembly attaches to one side. Both power and exhaust fluids are ported through the cylinder base. An important feature is the ability to provide adequate pressure at lower reversal, which assures operation of the pilot valve. This is an asset particularly important on viscous wells.

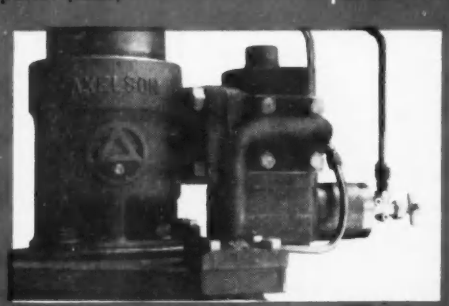
REVERSE VALVE AND PILOT VALVE are both hydraulically operated and the combination is simplicity itself in design. Only three pressure lines feed into the pilot valve. One is internally constructed to one end and two to the other end. Each of the pressure sources operates on different areas.

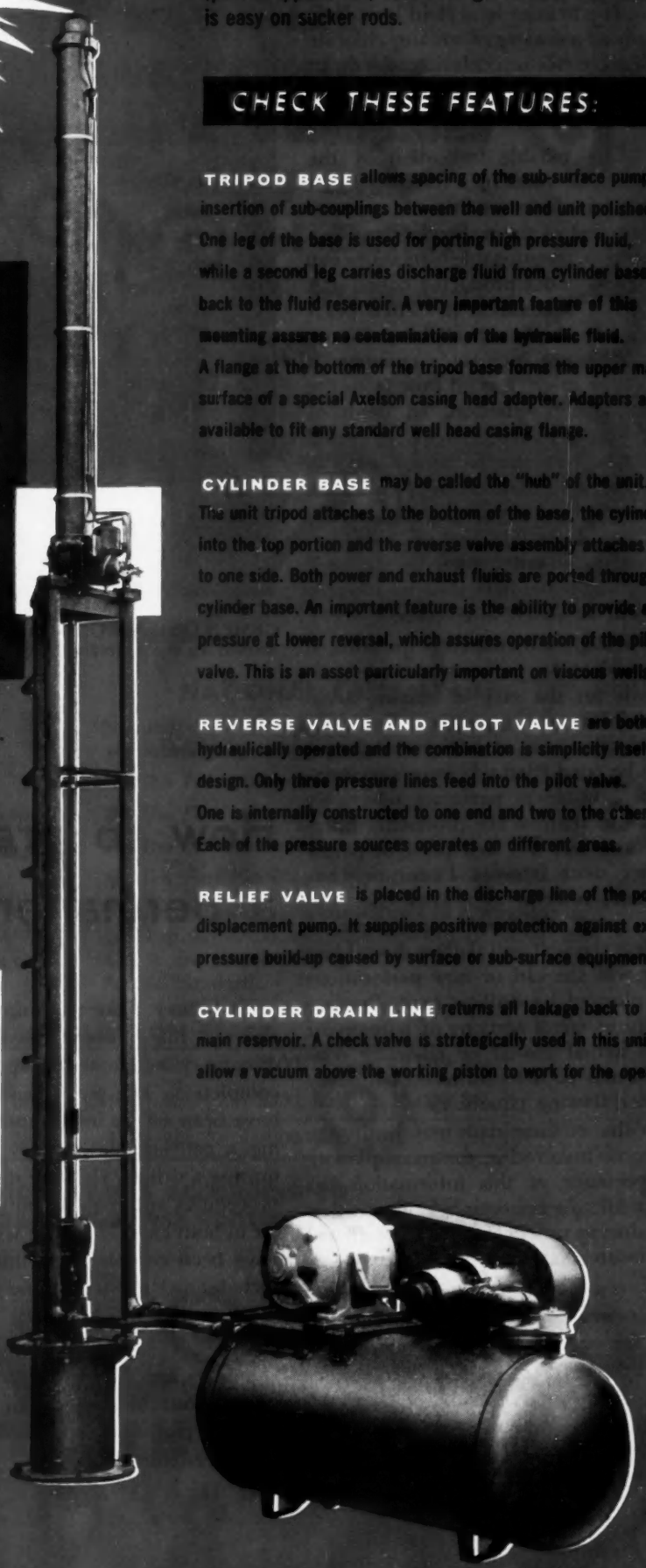
RELIEF VALVE is placed in the discharge line of the positive displacement pump. It supplies positive protection against excessive pressure build-up caused by surface or sub-surface equipment.

CYLINDER DRAIN LINE returns all leakage back to main reservoir. A check valve is strategically used in this unit to allow a vacuum above the working piston to work for the operator.

SPECIFICATIONS

Polished Rod Load (Max)	13,000 lbs.
Stroke Length (Nominal)	6 Feet
Strokes Per Minute (Max)	4.6
Upstroke Polished Rod Speed (Max)	86 FPM
Pump	40 GPM
System Fluid (Approx.)	65 Gals.
Cylinder Diameter	5 Inches
Operating Pressure (Max)	700 PSI
Input Horsepower (Max)	20 HP





AXELSON MANUFACTURING COMPANY DIVISION
PRESSED STEEL CAR COMPANY, INC.
LOS ANGELES 58, NEW YORK 7, ST. LOUIS 14, TULSA 1

RAILROAD FREIGHT CARS • STANDARD PARTS • DAIRY & FARM EQUIPMENT • WASTE CONTAINERS • STAINLESS STEEL COOKWARE • CAR ACCESSORIES • TANKS • AGITATORS • SMOKE STACKS • DUST COLLECTORS • COAL & ASH HOPPERS • FITTINGS & ELECTRICAL ACCESSORIES • ORDNANCE MATERIEL • SHELTER RELOCATABLE HOMES • EXPORT CKD: LOCOMOTIVES & TRACKWORK • CARS (MINE, ORE, CANE, INSPECTION) • WROUGHT METAL FRAMING • WEED BURNERS • BRICK & TILE MACHINERY • CANE LOADERS

LATHES: ENGINE • TOOL ROOM • HOLLOW SPINDLE • GAP BED • PETROLEUM PUMPING EQUIPMENT: DEEP WELL PLUNGER PUMPS • SUCKER RODS • HYDRAULIC PUMPING UNITS • AIRCRAFT COMPONENTS

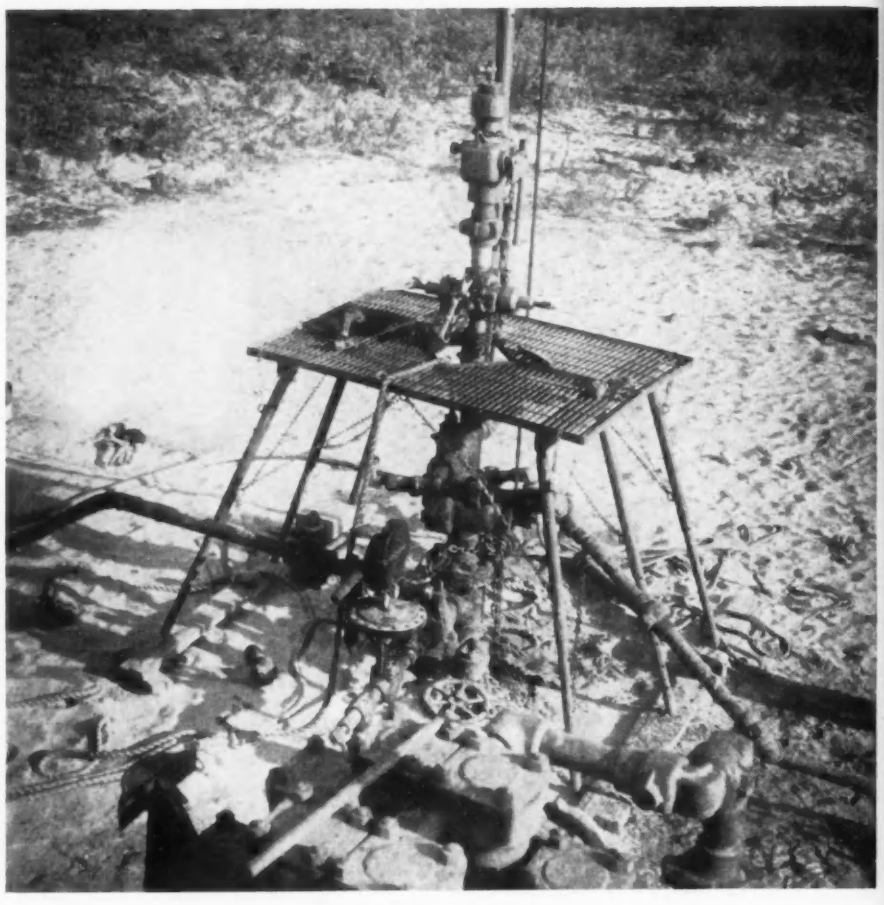
results in wells reworked to date. Where formation salt water is not available, it may be trucked in from nearby fields, or may be mixed at the well. Wells with pressure gradients slightly higher than that of salt water have been worked over without incident. If a heavier load fluid is desired, saturated solutions of sodium chloride with some calcium chloride added can be mixed with densities up to 10 pounds per gallon.

4. More reliable indication of the commercial value of a reservoir is obtained at little additional expense. Where cost of the recompletion is at a minimum, questionable formations can be tested under producing conditions. It is not uncommon in actual practice when the best available information does not indicate a commercial producer to get a good flow from the formation in question. In fields of multi-zone reservoirs, wells completed this new way can be recompleted in each zone successively at a minimum expense. Important, too, is that by making it feasible to test every potential zone intercepted by the well bore, additional barrels of recoverable oil will be added to reserves.

Through low-cost recompletions, it is possible to perforate a zone primarily for the sake of gaining additional data on the reservoir. Full scale production tests of sufficient duration can be conducted wherever necessary. It is possible to perforate selectively small sections of the producing interval and test the well prior to perforating more interval. Perforating additional interval at a later date will not entail the costly operations of killing the well and pulling the tubing, nor will the old or new perforations be plugged by drilling mud. Productivity of small sections of a reservoir and actual gas-oil or oil-water contacts may be determined economically under flowing conditions.

Value of these data may justify the expense involved in the recompletion. Importance of this information lies in predicting reservoir behavior so that producing practices can be conducted to insure maximum recovery.

It is anticipated that more accurate reservoir information made possible by low-cost recompletions promise to be of even greater value in oil recovery than the reduction of costs for initial completions and subsequent workovers.



CEMENTING TRUCK OPERATOR'S VIEW of a permanently completed well hooked up for squeezing. Equipment required on the workover job is small compared to conventional workover.

How to prepare a well for a permanent completion . . .

THE BEST TIME to equip a well to gain all the inherent advantages of this new technique is upon initial completion. However, existing wells have been set up in this manner during a conventional workover job requiring a drilling rig. The step-by-step procedures and requirements are similar in both cases. Types of wells which have been completed in this manner include: (a) flowing oil and gas wells; (b) gas lift wells; and (c) pumping wells.

There are several prerequisites which must be satisfied in order to make a permanent completion. Here are the essential ones:

1. Bottom of the tubing string must be open ended to permit passage of a gun perforator and other wire line equipment.
2. There must be no restrictions in the tubing to obstruct passage of wire line tools or perforating gun.
3. Bottom of the tubing string must be set above all zones to be perforated.
4. If a packer is used, means of communication between the tubing and casing annulus must be provided a short distance above the packer.
5. When packers and landing nipples are used, their I.D. must be large enough to permit passage

THE LEAK AND SEEP CURE!

NOW! NATIONAL TANK COMPANY includes ALL neoprene gasketing with ALL National Bolted Tanks at NO increase in price.

NATIONAL TANKS ERECTED BY NATIONAL, ARE GUARANTEED LEAKPROOF

NEW HARDWARE FOR RESET TANKS INCLUDES ONLY NEOPRENE GASKETING

NEOPRENE TANK GASKETS

resists deterioration caused by:

1. Sour Oil
2. Aviation Fuels
3. High Propane Content Oils

AVAILABLE WITH ALL ORDERS NOW! WORLDWIDE

a. Domestically Through National Branches
b. In Canada through National Tank Co., Ltd.
c. Export through National Supply Co., Export Division

NATIONAL TANK LEADS

National Tank Company, in only 28 years, has produced many "firsts" for bolted tanks . . .

1. The First "Long Base" oval hatch.
2. The First anti-channel drain baffle.
3. The First extended cleanout box.
4. The First Neoprene ringlet and washer.

National Tank gave its assistance and knowledge in building the API bolted Tank and Flange program. This is the present API 12-B Standard and Armed Forces Standard.

SIZES AVAILABLE FROM STOCK

65 Bbl.	100 Bbl.	250 Bbl.	Lo 500 Bbl.	Lo 1000 Bbl.	5,000 Bbl.
130 Bbl.	200 Bbl.	Hi 500 Bbl.	2R1000 Bbl.	2000 Bbl.	10,000 Bbl.
195 Bbl.	300 Bbl.	750 Bbl.	1500 Bbl.	3000 Bbl.	

BE SURE TO ORDER TANKS ACCORDING TO API STANDARD 12-B 1953 EDITION

It's a National®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

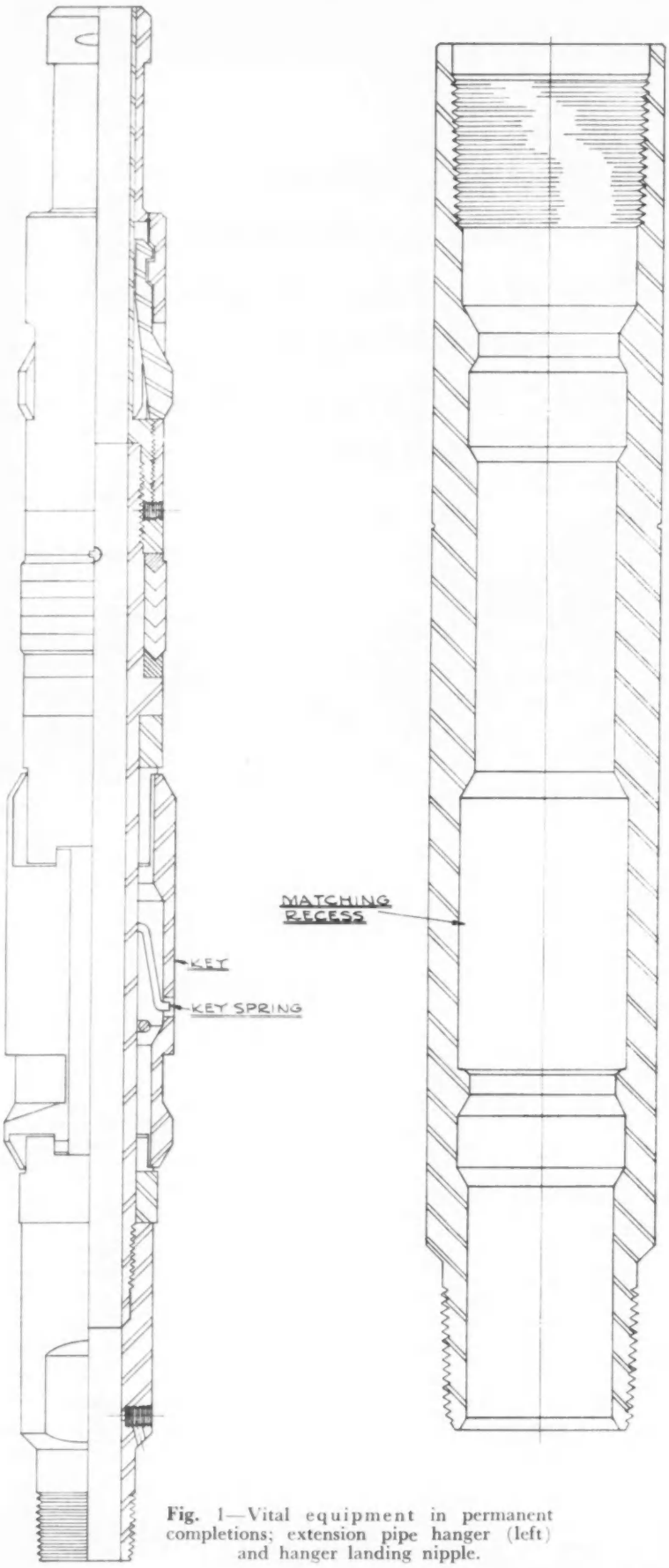


Fig. 1—Vital equipment in permanent completions; extension pipe hanger (left) and hanger landing nipple.

of the tubing-type perforator and other wire line equipment.

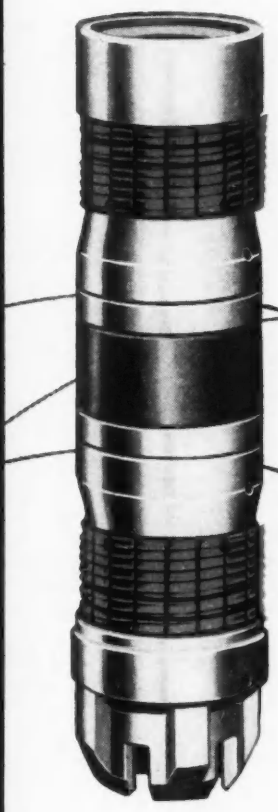
6. If a packer is used, it should be one that requires very little, if any, tubing weight to set. This is important to prevent kinks or bends resulting from excessive tubing weight on the packer.
7. The tubing string must be pressure tight.

Some Typical Permanently Completed Wells. It is realized that every well situation cannot be depicted here. However, most of the typical cases will be described so that they can be adapted easily by slight modifications to meet conditions of most wells found in the field. Equipment used will vary, of course, with existing conditions. Regardless of the conditions, wells prepared for permanent completions have much in common.

1. Flowing Well Without a Packer. This is the simplest type well to equip for a permanent completion. If the pressure gradient of the well is equal to or less than that of salt water, it is only necessary to attach a swage to the bottom of the open ended tubing. This swage is set above all zones to be perforated in the life of the well. The only special piece of equipment needed is an extension hanger landing nipple in which to seat a hanger that supports a string of one-inch aluminum pipe. This pipe is used in squeeze cementing operations. Figure 1 is a cross-section of the hanger and landing nipple.

If the pressure gradient is suspected of being higher than that of average salt water, an expendable tubing plug nipple may be used on bottom in place of the swage. Purpose of this nipple is to seat an expendable aluminum tubing plug. The plug is run in on wire line and is held in place by the pressure differential across it. Its use is desirable when running one-inch aluminum extension pipe for cementing work. Once the extension is in the tubing and a wire line lubricator installed, the plug may be pumped out the bottom of the tubing. Figure 2 shows a cross-section of this expendable tubing plug and

BAKER CAST IRON
TYPE BRIDGE PLUG



BAKER MAGNESIUM ALLOY
TYPE BRIDGE PLUG

PARTNERS

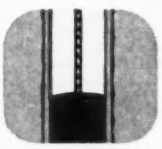
in performance

Either the Baker CAST IRON Bridge Plug, or the MAGNESIUM ALLOY Type will set positively, and prevent movement of fluid or gas either up or down the well, under any pressure safe for your casing.

For temporary installations, with no deleterious fluids present, the MAGNESIUM ALLOY Type is recommended. If the installation is permanent, or if harmful well fluids are encountered, use the CAST IRON Type.

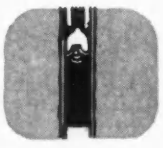
FOR WIRE LINE SETTING
contact any of these leading service organizations:

THE FORD ALEXANDER CORPORATION
BIRD WELL SURVEYS
BJ SERVICE, INC.
THE DIA-LOG COMPANY
DOWELL INCORPORATED
HUSKY GUNS, INC.
LANE-WELLS COMPANY
McCULLOUGH TOOL COMPANY
PERFORATING GUNS ATLAS CORP.
RAM-GUNS, INC.
SCHLUMBERGER WELL SURVEYING CORP.
WELEX JET SERVICES, INC.
THE WESTERN COMPANY



SET ON WIRE LINE

Although the Baker Bridge Plug can be set on tubing or drill pipe, *wire line setting* not only saves wear and tear on tubular goods, but the saving in time in deeper wells is an important advantage. Just call any of the wire line service organizations listed at left.



DRILL OUT QUICKLY

Baker Bridge Plugs are *short*, and have been designed with "drillability" in mind. The CAST IRON Type breaks up and drills out quickly. And the MAGNESIUM ALLOY Type requires the absolute minimum of drilling-out time.

DEPENDABLE

Baker Bridge Plugs maintain a perfect pack-off against upward or downward movement of fluid or gas under any pressure that is safe for the casing and well equipment.

BAKER BRIDGE PLUG

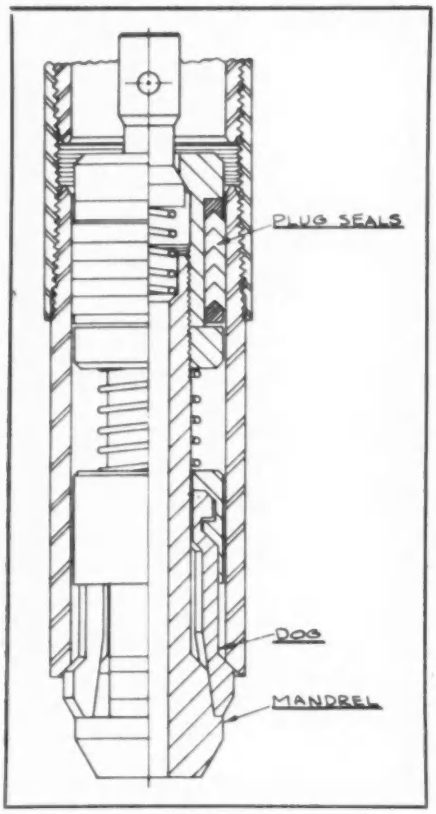


Fig. 2—Expendable aluminum tubing plug and nipple.

Fig. 3—Tubing-type gun perforator with collar locator and cable head attached.

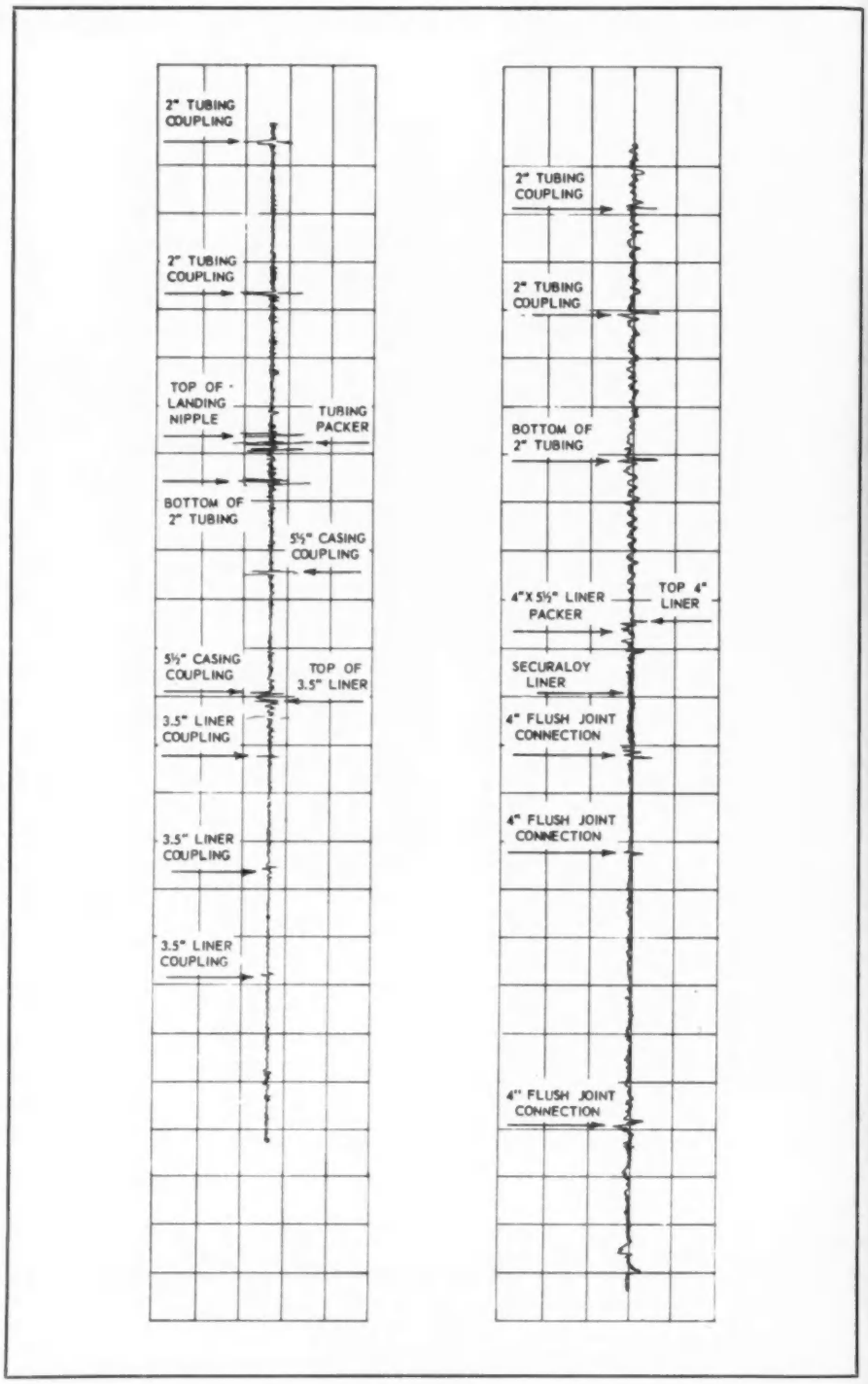


Fig. 4—Typical collar locator logs.

nipple. This nipple may be coupled onto the bottom of the extension hanger landing nipple.

Tubing should be checked for full opening and bends before it is run in the hole. This step is generally done by inserting the tubing gauge in each joint as it is picked up into the derrick. The gauge will fall through the joint if it is satisfactory; if it does not fall through, the joint should be replaced. Size of the gauge should be equal to the drift diameter of the tubing and should be at least four feet long.

The tubing is run in the hole while waiting on the casing cement to harden. Drilling fluid is circulated out and replaced with salt water. It is advisable to use additional tubing joints to touch bottom. By continually circulating with salt water all mud will be removed before completing the well. This practice will insure a clean hole.

Hydrostatic pressure at the bottom should be reduced below that of the expected formation pressure. This may be done by swabbing. Past experience indicates that a small differential into the casing will allow the well to come in without swabbing, provided the formation permeability is sufficient to obtain a flowing well.

At least 30 feet of head and pre-

WITH CAMCO YOU'RE SAFE!

ALL PARTS AND PACKING ARE SELECTIVELY RETRIEVABLE

If you would like to attend the CAMCO TECHNICAL SCHOOL on Gas Lift, please write for information.

CAMCO, INC.

7317 CANAL ST. • HOUSTON, TEXAS

ferably more, should cover the perforating gun to act as a cushion for the explosion. A conventional lubricator is used, and for an expendable type gun (Figure 3), the lubricator need be only long enough to accommodate the retrievable parts. Usually these consist of a cable head and magnetic collar locator, totaling about four feet in length.

There should be at least ten feet clearance between the end of the tubing and the top shot. The lowest shot is about one foot from the lower end of the gun.

A special collar locator has been used in conjunction with the perforating gun to control perforating depths accurately and to provide a permanent record of tubing and casing settings. Radioactivity logs provide a correlation between casing collars and formation depths.

The collar locator is 1¾ inches in outside diameter. It records casing collars, tubing bottom, tubing joints, landing nipples, packers (when used), and liner couplings. Typical collar locator logs are shown in Figure 4. The collar locator is a part of the tubing-type gun assembly, and the log is made on the same trip in the hole to perforate. When using this instrument, it is desirable to set the tubing so that at least two check points below the tubing are uncovered. These may be casing collars or liner couplings below the tubing, and are useful in correlating depth measurements.

The well is perforated with all well head connections made up and flow lines ready to handle fluid. After the charges are fired, the cable head and collar locator are drawn up into the lubricator and recovered.

Flow lines are opened to determine if the well will flow. If it will not, the tubing is swabbed. A typical well of this type is shown in Figure 5.

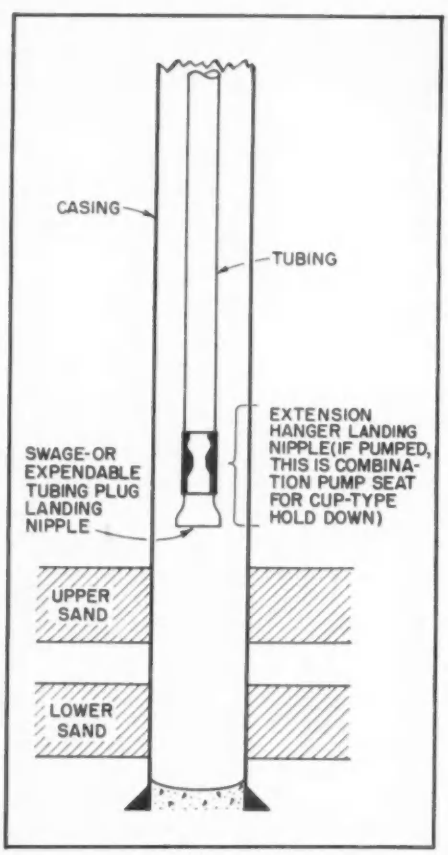
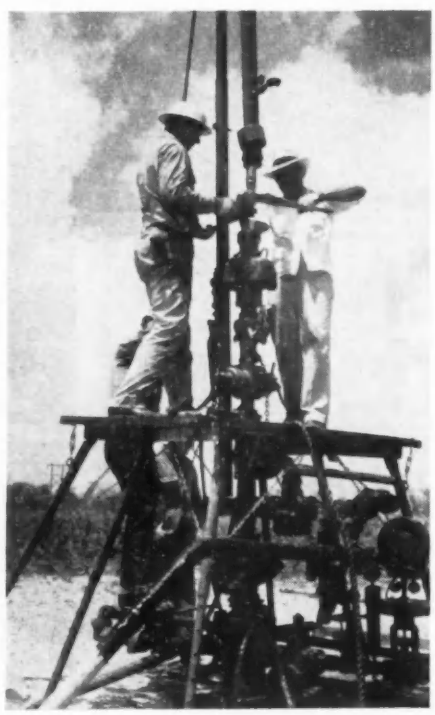

CASING
TUBING
EXTENSION HANGER LANDING NIPPLE(IF PUMPED, THIS IS COMBINATION PUMP SEAT FOR CUP-TYPE HOLD DOWN)
SWAGE-OR EXPENDABLE TUBING PLUG LANDING NIPPLE
UPPER SAND
LOWER SAND

Fig. 5—Simple completion, flowing or pumping well without a packer.



PORTABLE PLATFORM is essential when running extension pipe and setting up lubricators. Wire line trucks generally carry this collapsible frame.

2. Pumping Well Without a Packer. Completing a well of this type is almost identical with that of permanently completing a flowing well without a packer. Only difference is in the extension hanger landing nipple which in this case doubles as a pump seating nipple. The landing nipple is bored out to the same internal diameter as API pump seating nipples. This nipple is run in the string on bottom. Instead of an expendable tubing plug nipple below it, a swage may be used.

Standard size tubing-type gun perforator and collar locator (1¾-inch O.D.) are run in pumping wells equipped with 2½-inch tubing. If the pumping well contains 2-inch tubing, a special size gun and collar locator must be used to pass through the extension hanger landing nipple which also serves as a pump seating nipple. Size of this special gun is 1 11/16 inches in diameter.

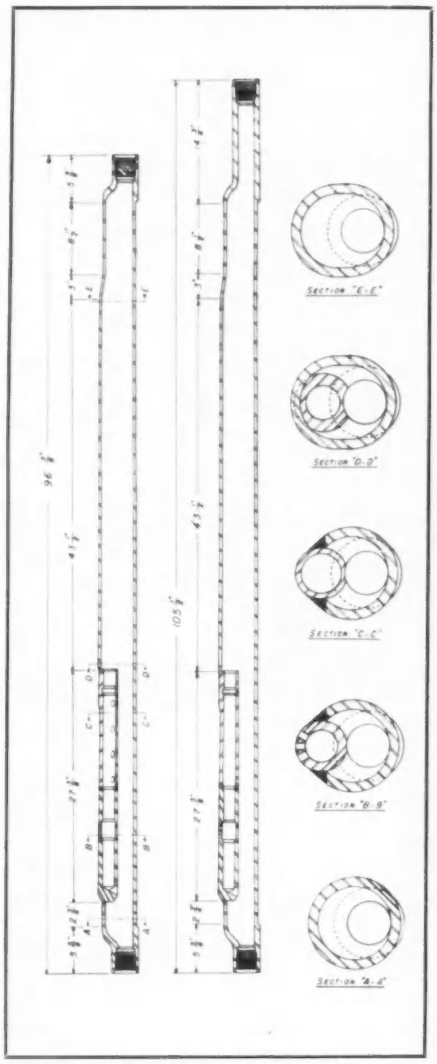


Fig. 6—Cross-section of offset type retrievable gas lift mandrel.

3. Flowing Wells Equipped with Packers. A large number of flowing wells thus far permanently completed have been equipped with tubing packers. Here again, it is well to emphasize the need for a full opening packer and one that requires very little setting weight. This latter point is particularly important in relatively deep wells.

Use of a packer in flowing wells necessitates the use of some means of communication between the tubing and casing annuus. This feature is essential in order to wash out sand or

Arquads® solve costly water flood problems!

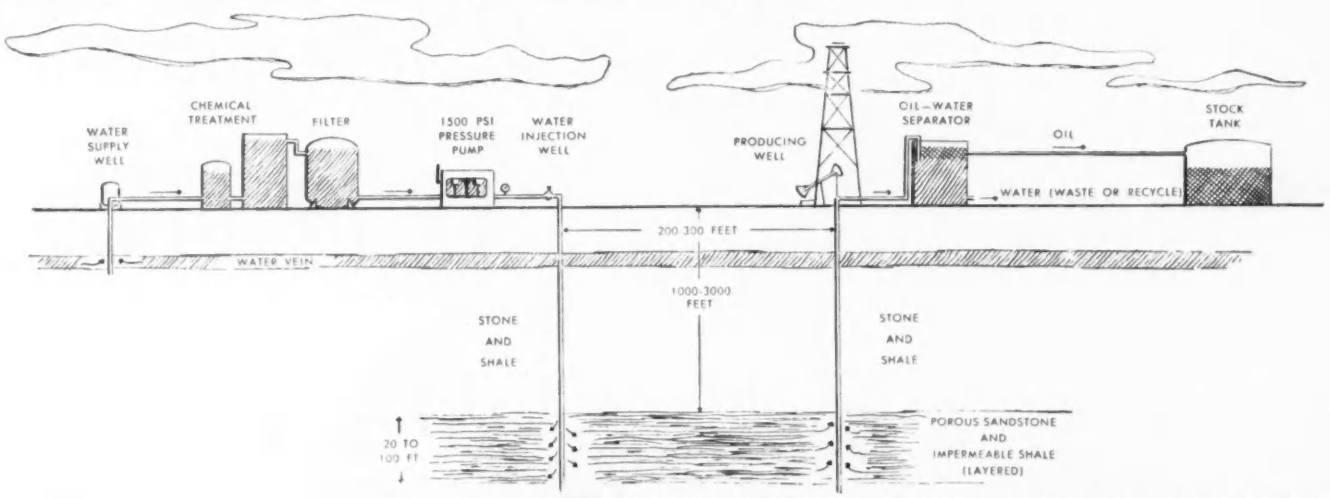
Arquads S-2C and T-2C combine effectiveness of Soya and Tallow Trimethyl Ammonium Chloride with Di-Coco Dimethyl Ammonium Chloride to combat bacteria—corrosion

Armour petroleum chemists have developed three basic products which may be used alone or in combination for preventing corrosion and inhibiting bacteria growth in secondary oil recovery systems. These are Arquad S (soya trimethyl ammonium chloride), Arquad T (tallow trimethyl ammonium chloride), and Arquad 2C (di-coco dimethyl ammonium chloride). A combination of the soya and di-coco compounds is available commercially as Arquad S-2C, and is widely used in secondary oil recovery operations.

Now a new product, Arquad T-2C, is available in which the tallow quaternary combined with the di-coco produces a material costing less per pound and equally effective. At the very low concentration of only 6 ppm Arquad T-2C has been found by petroleum producers to give a minimum of 95% corrosion protection (in some cases as high as 99.5%) and complete control of sulphate reducing bacteria. Arquad T-2C offers added economies—less plugging of sands and less down time for filter cleaning.

We highly recommend that you try all of these new corrosion—bacteria inhibitors in your system and compare the results.

For samples and technical bulletins which will help you make more profits out of secondary oil recovery, mail the coupon today!



ARMOUR CHEMICAL DIVISION

© Armour and Company • 1355 W. 31st St. • Chicago 9, Ill.

Mail this coupon with your letterhead

Please send me:

Samples: ☐ Arquad S ☐ Arquad T ☐ Arquad 2C ☐ Arquad S-2C ☐ Arquad T-2C

Information: ☐ Tech. Bull. E-6 ☐ Tech. Bull. G-3

*Name*_____

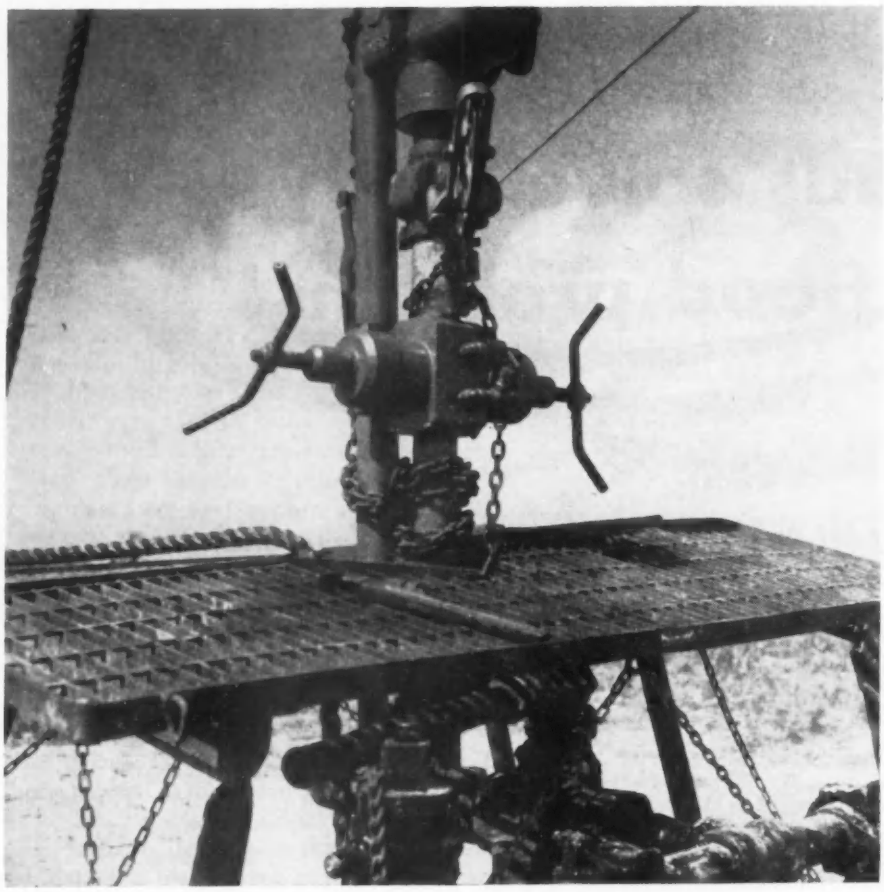
*Title*_____

*Firm*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

W 3



SMALL BLOWOUT PREVENTER tested for 10,000 psi working pressure may be equipped to seal around any tool or equipment run in the well by merely changing rams.

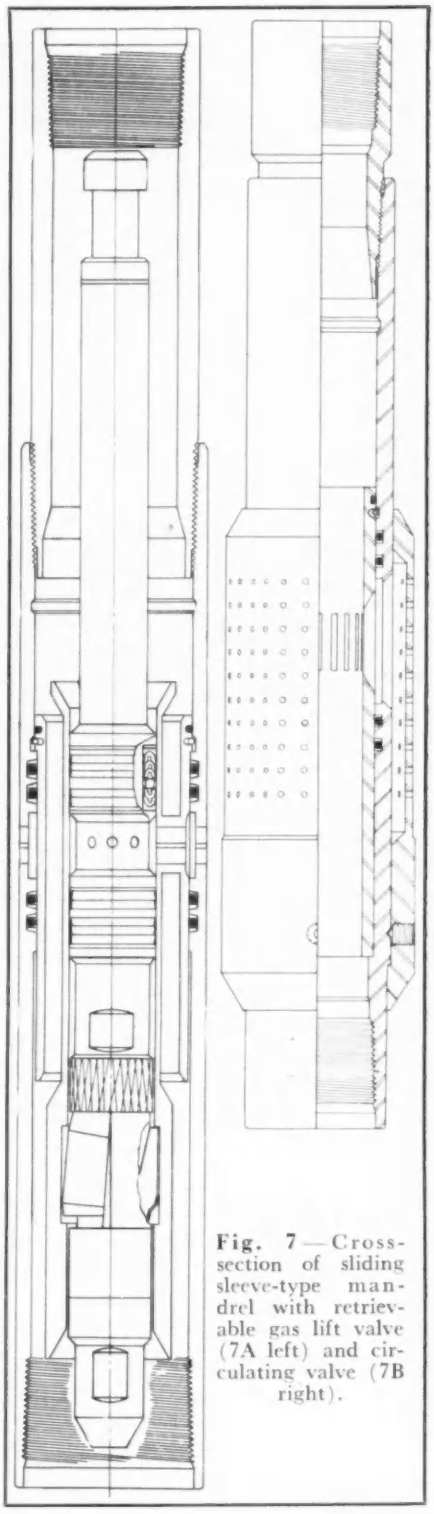


Fig. 7—Cross-section of sliding sleeve-type mandrel with retrievable gas lift valve (7A left) and circulating valve (7B right).

excess cement by reverse circulation and it facilitates spotting cement in the bottom of the well.

There are several ways in which communication can be accomplished. Two types of retrievable gas lift valves, although not specifically designed for this purpose, have been used. One is of the offset type, wherein the valve seats in a pocket mounted in the lower end of an eccentric mandrel, shown in Figure 6. When the pocket is occupied by a dummy or a circulating dummy, the opening through the mandrel is full bore and will accommodate all wire line tools used for this work.

Another type of retrievable gas lift valve useful for this purpose is one which seats inside the tubing bore in a mandrel incorporating a sliding sleeve mechanism. This valve is shown in Figure 7a. When the valve is seated, the sleeve automatically opens to expose slotted ports. When the valve is pulled, the sleeve automatically closes these ports. A shifting tool can be run to open the sleeve when a valve is not in place.

Both valves may serve as a means of circulating fluids between the tubing and annulus. They can also be used in normal production practice as injection valves to inject chemicals into the tubing. This is done by loading the annulus with the chemical mixture and applying pressure at the surface.

A third means of providing communication between tubing and annulus is by the used of a circulating valve, shown in Figure 7b. Essentially, this valve is of the sliding sleeve type, with an I.D. the same as that of the tubing. The sleeve is manipulated by a shifting tool that is run in to close or open the sleeve.

Prior to running a fully equipped tubing string in a packed-off well, it is desirable to run a straight string of tubing with a rock bit on bottom. If the bottom is too high, it may be drilled out to desired depth. The hole can be cleaned to bottom by displacing drilling mud with salt water. The well is cleaned and this string removed.

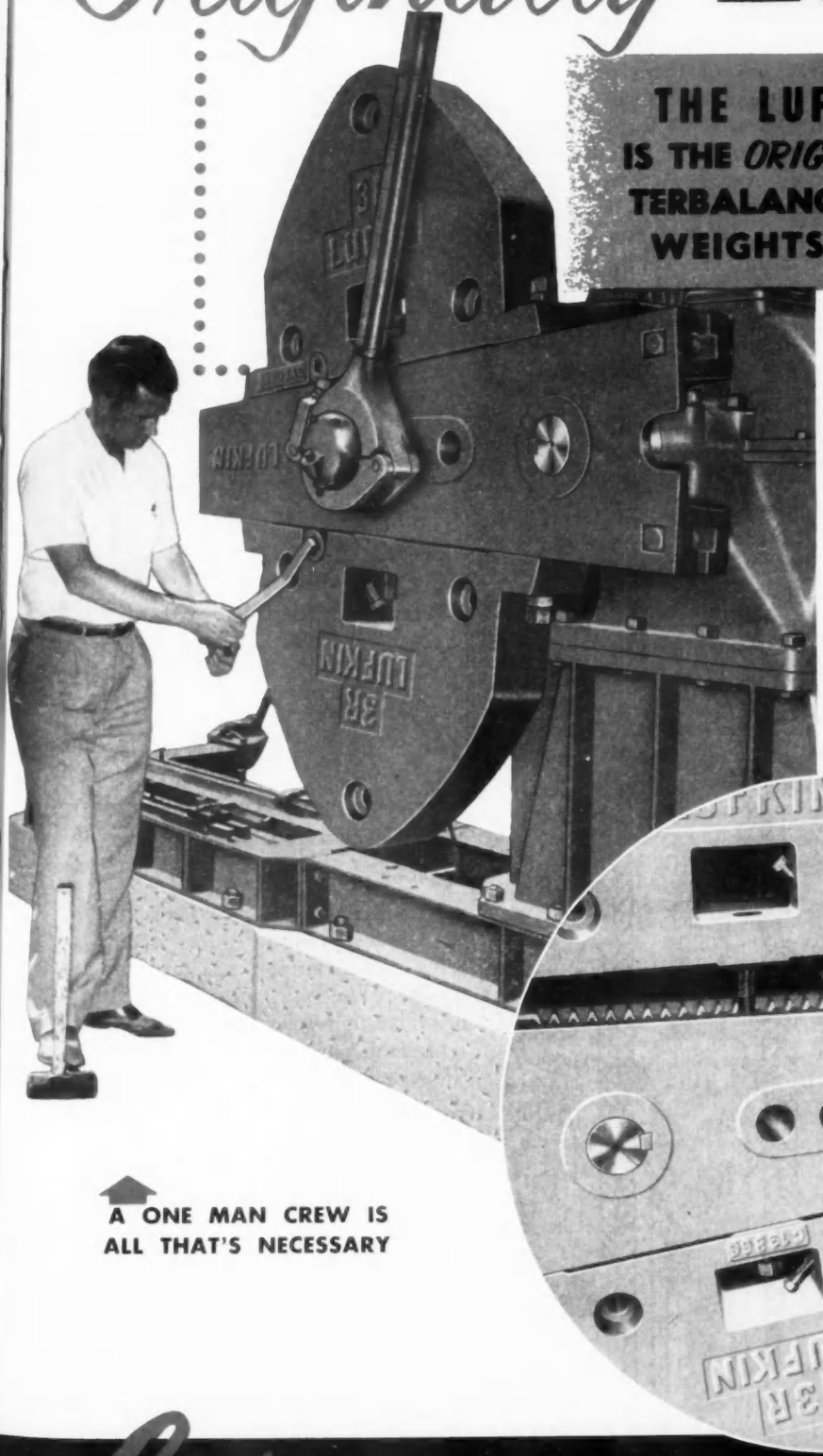
If a wire line packer is used, it is run in and set. If not, the packer is run in on the fully equipped tubing string.

The tubing string for a flowing well with a packer contains the following equipment, commencing on bottom:

1. Expendable tubing plug nipple.
2. Production packer. If a wire line packer has been set, this section will be a seal nipple and a production tube.
3. Tubing pup joint. (When a col-

Originally LUFKIN

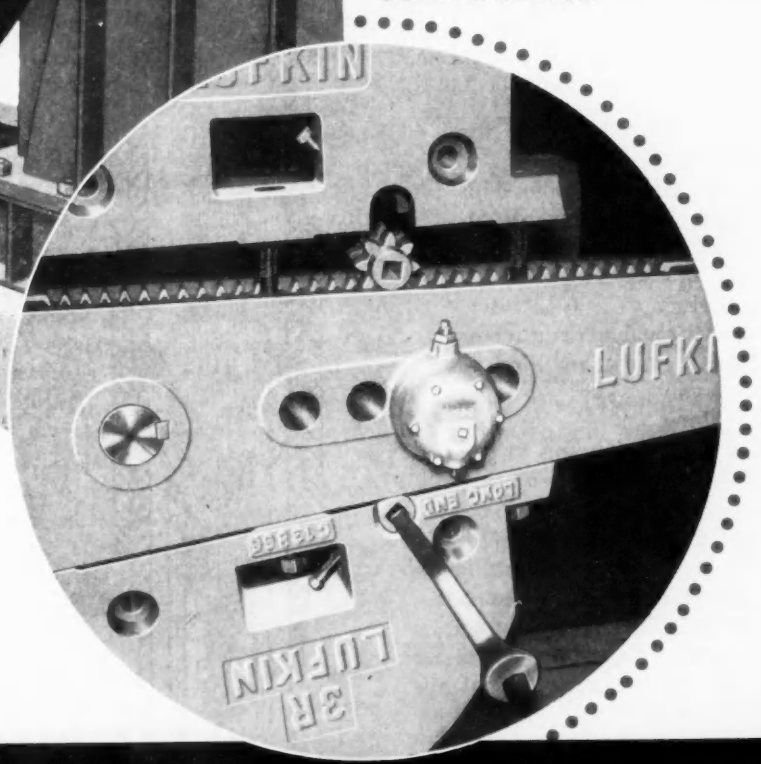
THE LUFKIN TROUT CRANK IS THE *ORIGINAL* ADJUSTABLE COUNTERBALANCED CRANK! NO LOOSE WEIGHTS TO ADD OR REMOVE



NOW BUILT WITH RACK AND PINION FOR GREATER EASE AND CONVENIENCE IN MOVING THE COUNTERWEIGHTS.

ALL FOUR COUNTERWEIGHTS CAN BE ADJUSTED WITHOUT REPOSITIONING CRANKS.

THE SAME RUGGED SIMPLICITY WITH ADDED SAFETY AND CONVENIENCE.



A ONE MAN CREW IS ALL THAT'S NECESSARY

Lufkin **FOUNDRY & MACHINE COMPANY**

LUFKIN, TEXAS

Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming, Great Bend, Kansas, Effingham, Illinois, Duncan, Oklahoma, Brookhaven, Mississippi

Lufkin Equipment in CANADA is handled by

THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, Edmonton, Alberta, Canada.

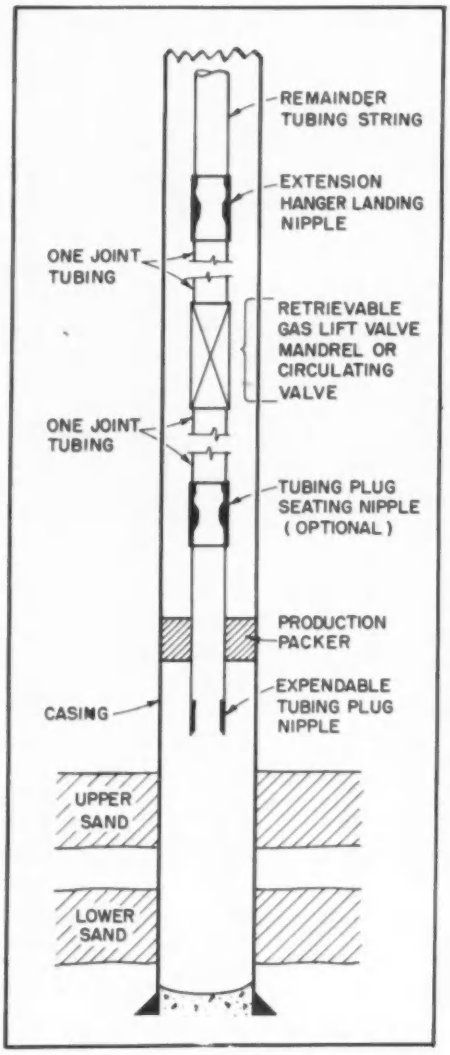


Fig. 8—Schematic of permanently completed flowing well with packer.

lar recess is not provided by the connection to the packer.)

4. Tubing plug landing nipple. This is optional, and is useful in spotting mud or inhibitors behind the tubing upon completion of job.
5. Joint of tubing.
6. Offset gas lift valve mandrel or sliding sleeve gas lift mandrel or circulating valve.
7. Joint of tubing.
8. Extension hanger landing nipple (similar to tubing plug seating nipple).
9. Remainder of tubing string.

If the offset type mandrel is run, a dummy or inhibitor injection valve is seated in the pocket; if the sliding sleeve type is used, the sleeve is closed when run. The circulating valve, if used, also is run in closed.

The packer is set at a point to place the bottom of the tubing string at least ten feet above all zones which might be perforated in the future. Surface equipment is connected up, desired hydrostatic head left in the tubing and the well perforated with the tubing type gun. Perforating procedures are similar upon initial completion in all type wells. Figure 8 illustrates this type well.

4. Gas Lift Wells. For this discussion, gas lift wells are placed under the heading of the packed off type since very few of them produce efficiently without the use of a packer. Equipping a well of this type for a permanent completion is not too unlike procedures outlined for completing a flowing well which utilizes a packer. If the sliding sleeve type retrievable gas lift valve mandrel is used, it may be run near the packer. The eccentric mandrel should be spaced at least one joint of tubing above the packer. Reason for using one or more tubing joints above the packer is to take care of the eccentricity of the mandrel. Since the tubing connection on the packer is centered in the hole, and the eccentric mandrel pushes the tubing to one side of the casing (this is only true in 5½-inch casing), additional tubing length will eliminate any strain or stress on the packer.

Use of the circulating valve is not required in gas lift wells, but may be used if it is not necessary to gas lift from this lower depth. The lower

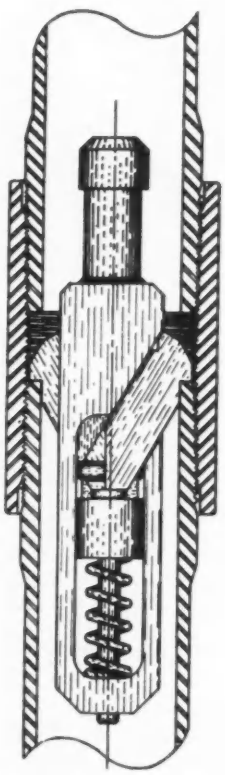


Fig. 10—Retrievable tubing stop with collar locking mechanism.

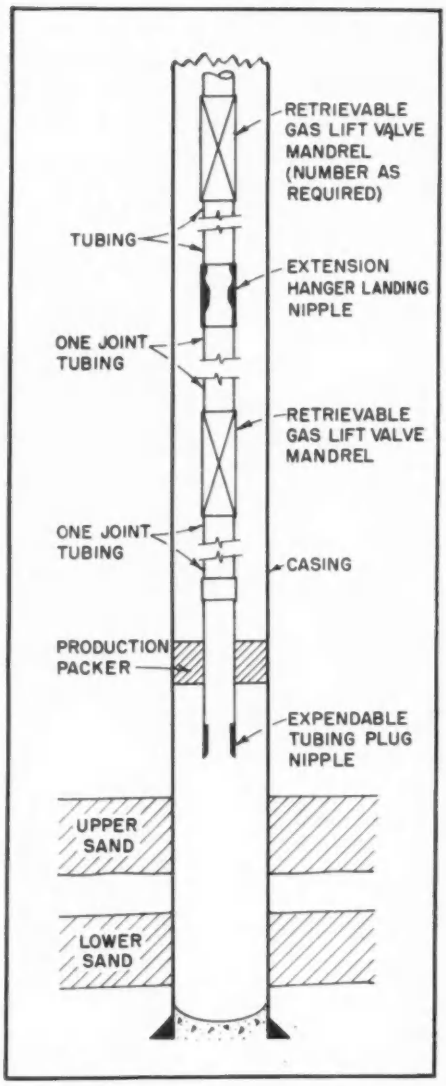


Fig. 9—Permanently completed gas lift well.

valve provides a means of communication required for future recompletions. An extension hanger landing nipple is run one joint above the gas lift valve mandrel. Above this are run remaining gas lift valve mandrels in the string. The tubing string is run in the hole with all mandrels above the extension hanger landing nipple equipped with conventional gas lift valves. Depending upon which type mandrel is used, either the dummy valve is run, or the sliding sleeve is closed. Once the tubing is set, the valves are useful in jetting fluid down to the desired level. After perforating the well, gas lifting will help bring in the well. A typical gas lift installation for permanent completions is shown in Figure 9.

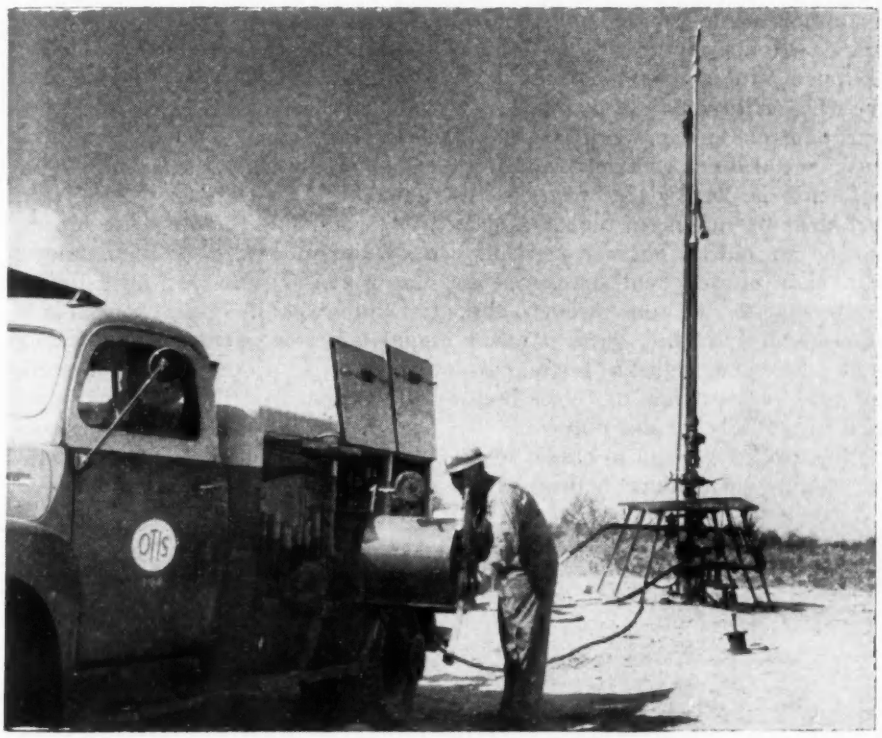
Use of a Tubing Stop. A device called a retrievable tubing stop, Figure 10, may be run in the tubing to catch

all wire line tools accidentally dropped. Without the tubing stop, equipment lost in the well will fall out the tubing bottom and will be impossible to retrieve again. Fluids pass freely through the device.

It locks in the collar recess between two joints of tubing, and should be placed in the first collar recess above the packer.

If a wire line packer is used, the tubing screws into a seal nipple connection which does not provide adequate recess in which to lock the tubing stop. Purpose of the pup joint above the packer seal nipple is to provide this recess at a point below the landing nipple or mandrel in the string.

The stop is removed only when it is necessary to work below it. When any appreciable amount of wire line work is to be performed above the packer, the tubing stop is run back in the tubing. Its use has paid rewards on many jobs.



WIRE LINE OPERATOR is a key figure when working over permanently completed wells. He must be able to "see" down the well by merely feeling the wire line.

Working over permanently completed wells...

BIGGEST SAVING in dollars and cents is derived in working over permanently completed wells. Flexibility made possible by this type installation and use of relatively inexpensive wire line methods are responsible for reducing these costs. Types of jobs performed to date on wells completed in this manner include:

1. Reperforating a producing interval.
2. Washing out sand from bottom of the hole.
3. Squeeze cementing a perforated interval in a producing formation and perforating another interval either above or below the original perforations in the same formation, or a portion of the original interval.
4. Squeeze cementing perforations in one producing horizon, and perforating in another producing horizon either above or below the first.

Reperforating a producing interval is the simplest type of job to do on a permanently completed well. Wells have been reperforated at savings up to 75 percent of comparable jobs by conventional methods. It is not necessary to kill the well, only to shut it in. The tubing-type gun is lubricated into the well, lowered to the desired depth and fired. If an expendable type gun is used, retrievable sections are removed from the well and production continued. For the average well, only a few hours are required if the well has been set up properly.

In washing out sand from bottom or in reversing out excess cement in squeeze jobs, it is necessary to extend the tubing. This has been done by using a tubing extension of the required length. It consists of 1-inch aluminum pipe, in 10-foot lengths, joined with API iron couplings. It is attached to the extension hanger which seats in the extension hanger landing nipple.

Working Over a Flowing Well Without a Packer. The easiest type of permanently completed well to work over is a flowing well of normal pressure gradient (equal to or less than that of salt water).

First step is to circulate salt water into the well. When the cement plug is to be located accurately and pipe measurements are not satisfactory, the tubing hanger should be correlated to casing collars by a collar log.

Wire line equipment rigged on the christmas tree should include the following on all jobs, regardless of well type:

1. Wire line blowout preventer that will seal on any tool run into the well.
2. Lubricator of sufficient length to hold the longest single nondismountable tool to be used.
3. A wire line stuffing box.

In the interest of safety and in order to facilitate handling tubing extensions, lubricators, and other wire line tools, a personnel platform should be set up around the wellhead. These platforms are generally carried on wire line trucks and are readily assembled. A gin pole, normally used for lifting the wire line lubricator, is utilized in removing and inserting long strings of one-inch aluminum extension pipe.

Most wire line workovers have been

performed with a .082-inch single strand wire line. There are some units equipped with a 3/16-inch stranded line. The latter line is intended primarily for use in handling heavier extensions and is not generally needed.

Tubing is checked for restrictions and kinks by running a tubing gauge having an outside diameter greater than that of any tool or piece of equipment to be run through the tubing string. A full sized paraffin knife (commonly called a "biscuit cutter") or a swedging tool has been used successfully for this purpose.

A locator tool is run to obtain wire line depth correlations between the landing nipple (or nipples), bottom of the tubing and bottom of the well. These measurements are correlated with the radioactivity log or other well logs to determine the length of one-inch aluminum extension pipe required.

It is desirable to run a sub having a maximum recording thermometer during this operation to estimate cementing temperatures. Bottom-hole temperature is important in arriving at the correct proportions for a modified cement. Well temperatures may be reduced slightly by circulating cool salt water to employ safely the available modified cement mixture.

MOBILE EQUIPMENT assembled above performs the workover job. Only the perforating truck is missing. Last joint of one-inch aluminum extension pipe is being lowered into the well.

Extension used in removing sand from the well . . .

IF THE WIRE LINE locator tool checks sand on bottom in sufficient volume to interfere with subsequent cementing work, this sand must be washed out. The extension tube is modified to incorporate telescoping joints. Purpose of the telescoping joint is to move the end of the extension pipe down the well as sand is washed out. This operation could not be accomplished with the regular extension pipe which has a fixed length.

The telescoping joint is made up of a 10-foot long section of steel pipe having an I.D. of 1½ inches and O.D. of 1⅝ inches. Telescoping inside of the steel section is a 10-foot joint of 1-inch aluminum pipe, the lower end of which contains an integral flanged lip. When the outer steel barrel slides down to expose the inner one-inch aluminum pipe its full length, this flanged lip seats on a shoulder at the top of the steel barrel. A packing gland in this shoulder seals off the annulus between the two tubes. When extended, over-all length of the telescoping joint is about 20 feet; when collapsed, about 10 feet.

If the amount of sand fill-up is not more than 30 feet, three of these telescoping joints in the extension pipe will handle the sand washing job. If the fill-up is more than 30 feet, the washing out procedure will entail additional trips with the extension pipe, for it is advisable not to run more than three telescoping joints.

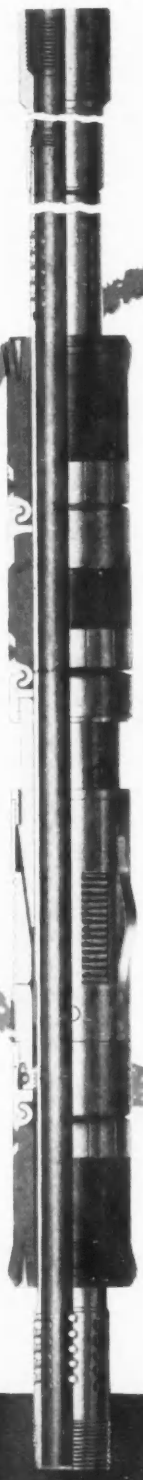
With the well killed, the telescoping extension pipe may be run in the well on wire line by means of the extension hanger, shown in Figure 1.

The small clearance between the hanger and the tubing acts as a choke which tends to relieve some of the tension on the wire line. The extension hanger is lowered in the tubing with a running tool equipped with a sealing prong that blocks flow through the extension pipe. Once the hanger is seated in the landing nipple, the tubing may be pressure tested both in burst and in collapse before any sand-washing or cementing operations are begun.

After the tubing is tested, the running tool is retrieved and a blind box run in to assure that the extension hanger is locked in place. Reverse circulation will cause sand to flow up into the aluminum extension. The telescoping joints will permit the extension bottom to follow the sand level during the washing operation.

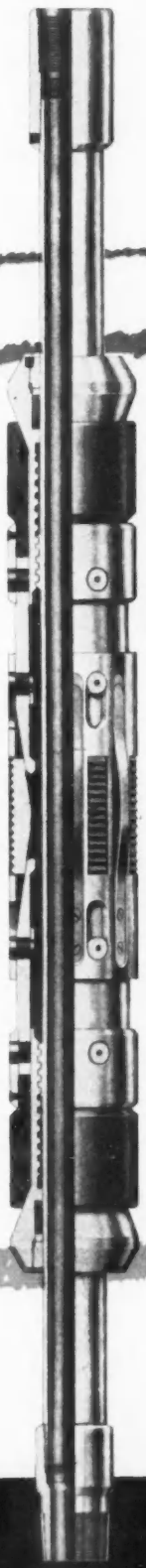
Once reverse circulation is established and the sand or other material comprising the fill are placed in motion, circulation should be continued without interruption until either all of the fill has been displaced or until sufficient fill has been removed to allow all the telescoping joints to extend their full length. In no case should circulation be discontinued as long as returns carry any appreciable quantity of sand or other solid particles. It is advisable to continue circulation after returns have been found free of solids for a period not less than

COMPLETIONS . . .



This reliable, all-purpose utility packer is being successfully used in all types of well completions. It's easy to run, easy to set, easy to pull. It holds against high differential pressures in either direction, and because of the small amount of set-down weight required, the tubing can be kept in tension.

BROWN DUO-PAK

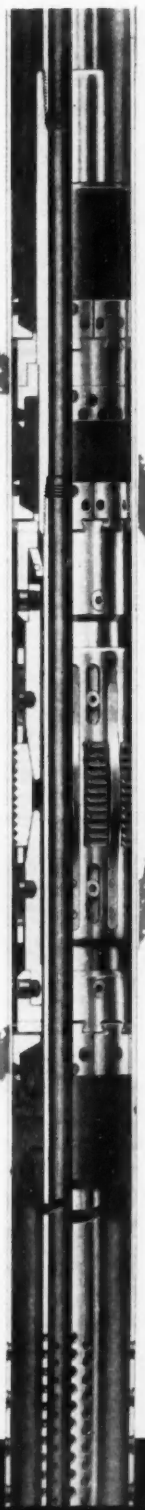


With this mechanical set packer, the tubing is rigidly anchored with packing and slips so that it cannot move in either direction. Since no set-down weight is required to effect a seal, the tubing can be set with as much tension as desired.

All working parts are enclosed by the seals above and below, protecting these vital parts from corrosion or debris.

Ideal for the top packer in a two packer dual completion, since it is set mechanically at any desired point without having tubing weight to reckon with.

BROWN B-4



This versatile, all-purpose packer has the proved basic features of the popular Duo-Pak, with the added advantage of Wire Line running and retrieving. The split cups effect a dual seal with the tubing and casing to provide tremendous resistance to high differential pressures, and because of the two opposed slip cones, pressure from either direction tends to set the slips all the tighter in the casing. Because only the cross-sectional area of the tube itself is exposed to upward pressure, the necessity of large tubing loads as a hold-down measure is eliminated. It is completely drillable in cases of extreme emergency.

BROWN WIRELINE

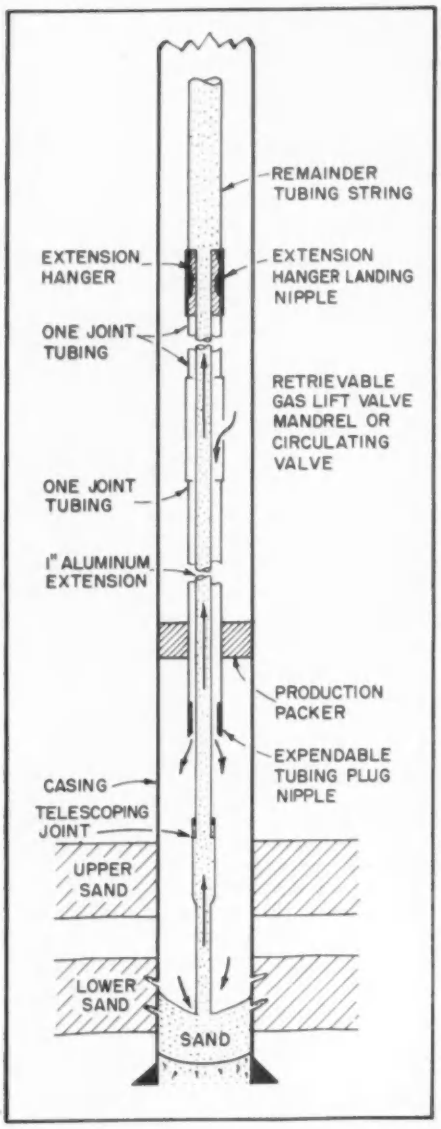


Fig. 11—Use of telescoping extension joint to wash sand from flowing well.

the time required to displace tubing volume.

When the telescoping sections have been extended their maximum length, a pulling tool is run in and the extension pipe pulled to the surface. If additional pipe is required, it is added, and the equipment rerun. The process is repeated until sand is washed out to the desired depth.

If several trips are required to remove sand, it is sometimes desirable to run a slip-type hanger on the extension pipe equipped with telescoping joints. The extension pipe can be spotted lower in the well by resetting the slip-type extension hanger which never goes below the extension hanger landing nipple. The landing nipple will provide a safety stop and a depth reference. Washing out sand is illustrated in Figure 11.

NEW GAMMA RAY LOG was developed specifically to run through tubing. When used in conjunction with collar locator log, formations are correlated with casing collars for accurate perforating.

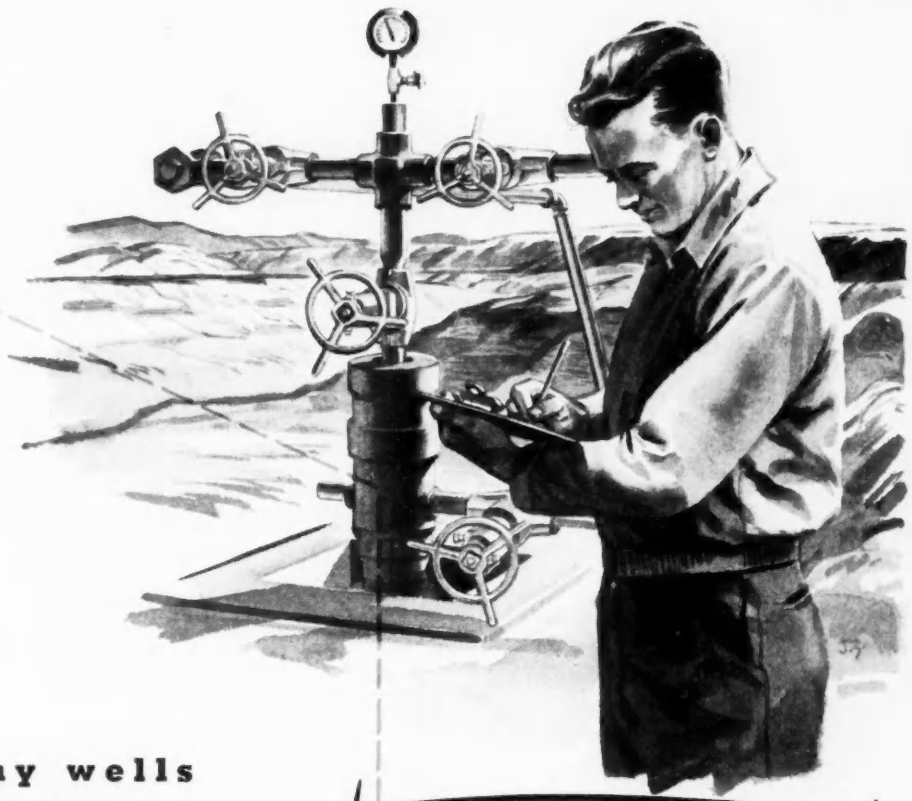
Squeeze cementing wells permanently completed . . .

SINCE SQUEEZE cementing of existing perforations is one of the more important phases of working over permanently completed wells, some details are necessary. Experience has shown that small volumes of cement and relatively low squeeze pressures have given good results in this type work. Development of a modified cement (see bibliography) has been used with excellent results. It is a mixture of common portland cement, bentonite and calcium lignosulfonate. Bentonite has been used in cement for a number of years with good results. Squeeze cementing many permanently completed wells indicates that a mixture containing about 12 pounds of bentonite per sack of cement is desirable.

Calcium lignosulfonate retards cement setting time, and is used to overcome the effects of bottom-hole temperature which tends to speed up setting time. The amount of calcium lignosulfonate used will vary with bottom-hole temperature. The following amounts of the additive have been used in cement mixtures containing 12 pounds of bentonite per sack of regular portland cement:

Formation Temperature, Degrees Fahrenheit	Calcium Lignosulfonate Added, Lbs. per Sack Cement
Below 140	0.5
140—180	0.6
180—220	0.7
220—250*	0.7—0.8*

*When modified cement is used in wells of this temperature range, it is desirable to run a laboratory test prior to squeezing the well in the field. If this is not practical, the well may be cooled slightly by circulating cool salt water equivalent to at least one volume of the system. This is done just



Why do so many wells have Gulfco Well Heads?

With GULFCO Well Heads, you get the benefits of 35 years' experience. This means simpler completion procedures, greater safety and lower over-all costs.

Simpler completions are assured by the wide variety of field proven interchangeable hangers available.

Greater safety is assured because all parts are made of forged steel for strength and uniformity.

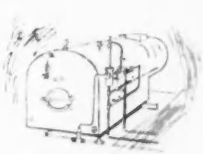
Lower costs are assured because you get the right equipment for the job—priced right—for every well.

Call your nearest GULFCO representative for full information.

Forged Steel Xmas Trees

Slip-on Weld Casing Nipples and Collars for quicker tubing head installation

Oil Field Boiler Burners . . . Gas and Feed Water Regulators



See GULFCO 20-page section in Composite Catalog

GULFCO

FORGED STEEL WELL HEAD EQUIPMENT

GULF COAST MACHINE & SUPPLY CO. GULF CO TRADE MARK PRODUCTS BEAUMONT & HOUSTON, TEXAS

GULF COAST MACHINE & SUPPLY CO.

GENERAL OFFICE AND SHOP: 305-315 Orange Street, P. O. Box 1150—Phone 2-8481

BEAUMONT, TEXAS

HOUSTON SALES OFFICE: Esperson Bldg., Houston 2, Texas—Phone FAirfax 1544 • **CORPUS CHRISTI SALES OFFICE:** 3407 Agnes Street—Phone 2-5361 • **WICHITA FALLS SALES OFFICE:** 100 Henrietta Street—Phone 2-9407 • **ODESSA SALES OFFICE:** 207 North Amburgey St.—Phone 2-2895 • **NEW YORK EXPORT OFFICE:** R. S. Stokvis & Sons, Inc., 17 Battery Place, New York 4, N. Y.

4777

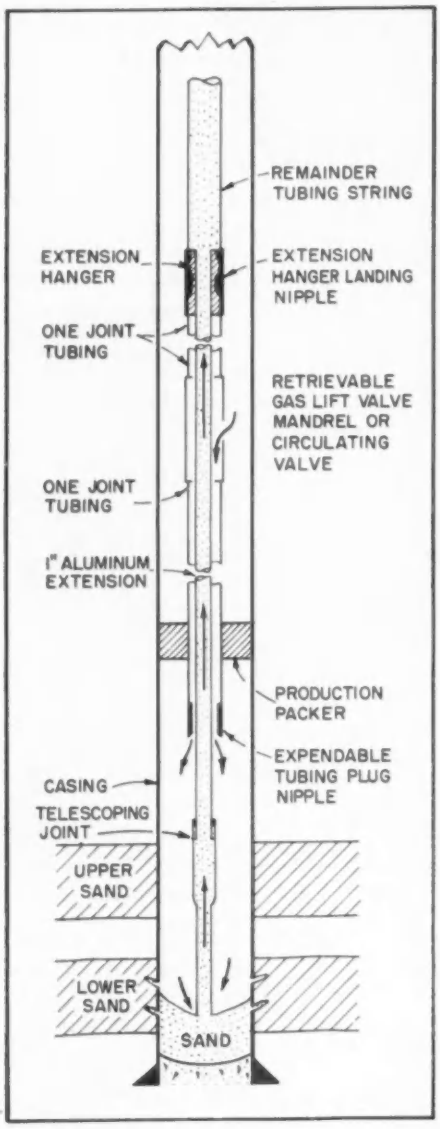


Fig. 11—Use of telescoping extension joint to wash sand from flowing well.

the time required to displace tubing volume.

When the telescoping sections have been extended their maximum length, a pulling tool is run in and the extension pipe pulled to the surface. If additional pipe is required, it is added, and the equipment rerun. The process is repeated until sand is washed out to the desired depth.

If several trips are required to remove sand, it is sometimes desirable to run a slip-type hanger on the extension pipe equipped with telescoping joints. The extension pipe can be spotted lower in the well by resetting the slip-type extension hanger which never goes below the extension hanger landing nipple. The landing nipple will provide a safety stop and a depth reference. Washing out sand is illustrated in Figure 11.

NEW GAMMA RAY LOG was developed specifically to run through tubing. When used in conjunction with collar locator log, formations are correlated with casing collars for accurate perforating.

Squeeze cementing wells permanently completed . . .

SINCE SQUEEZE cementing of existing perforations is one of the more important phases of working over permanently completed wells, some details are necessary. Experience has shown that small volumes of cement and relatively low squeeze pressures have given good results in this type work. Development of a modified cement (see bibliography) has been used with excellent results. It is a mixture of common portland cement, bentonite and calcium lignosulfonate. Bentonite has been used in cement for a number of years with good results. Squeeze cementing many permanently completed wells indicates that a mixture containing about 12 pounds of bentonite per sack of cement is desirable.

Calcium lignosulfonate retards cement setting time, and is used to overcome the effects of bottom-hole temperature which tends to speed up setting time. The amount of calcium lignosulfonate used will vary with bottom-hole temperature. The following amounts of the additive have been used in cement mixtures containing 12 pounds of bentonite per sack of regular portland cement:

Formation Temperature, Degrees Fahrenheit	Calcium Lignosulfonate Added, Lbs. per Sack Cement
Below 140	0.5
140—180	0.6
180—220	0.7
220—250*	0.7—0.8*

*When modified cement is used in wells of this temperature range, it is desirable to run a laboratory test prior to squeezing the well in the field. If this is not practical, the well may be cooled slightly by circulating cool salt water equivalent to at least one volume of the system. This is done just

Why do so many wells have Gulfco Well Heads?

With GULFCO Well Heads, you get the benefits of 35 years' experience. This means simpler completion procedures, greater safety and lower over-all costs.

Simpler completions are assured by the wide variety of field proven interchangeable hangers available.

Greater safety is assured because all parts are made of forged steel for strength and uniformity.

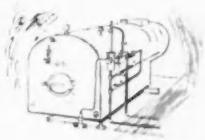
Lower costs are assured because you get the right equipment for the job—priced right—for every well.

Call your nearest GULFCO representative for full information.

Forged Steel Xmas Trees

Slip-on Weld Casing Nipples and Collars for quicker tubing head installation

Oil Field Boiler Burners . . . Gas and Feed Water Regulators



See GULFCO 20-page section in Composite Catalog

GULFCO

FORGED STEEL WELL HEAD EQUIPMENT

GULF COAST MACHINE & SUPPLY CO. GULFCO TRADE MARK PRODUCTS BEAUMONT & HOUSTON, TEXAS

GULF COAST MACHINE & SUPPLY CO.

GENERAL OFFICE AND SHOP: 305-315 Orange Street, P. O. Box 1150—Phone 2-8481

BEAUMONT, TEXAS

HOUSTON SALES OFFICE: Esperson Bldg., Houston 2, Texas—Phone FAirfax 1544 • **CORPUS CHRISTI SALES OFFICE:** 3407 Agnes Street—Phone 2-5361 • **WICHITA FALLS SALES OFFICE:** 100 Henrietta Street—Phone 2-9407 • **ODESSA SALES OFFICE:** 207 North Amburgey St.—Phone 2-2895 • **NEW YORK EXPORT OFFICE:** R. S. Stokvis & Sons, Inc., 17 Battery Place, New York 4, N. Y.

4777

prior to cementing to reduce formation temperatures.

Mixtures of regular portland cement, 12 pounds of bentonite per sack and concentrations of calcium lignosulfonate as indicated above result in slurries having pumpability times in excess of 2¼ hours. Actual cementing time for permanently completed wells is less than two hours. It is essential that the dry ingredients be blended thoroughly prior to mixing with water.

How To Calculate Volumes Needed. Total volume of slurry may be based on dry volume of solids in the slurry. One sack of regular portland cement (94-pound sack) has an absolute volume of 3.60 gallons. One sack of dry cement containing 12 pounds of bentonite has a volume of 4.20 gallons. Hence, 10 sacks of dry cement with bentonite occupy a volume of one barrel. Total volume of cement slurry will be the volume of dry ingredients plus volume of mix water.

Example: If the bottom-hole temperature is 165° F. in a 5000-foot well, the following may be used: 33 sacks of portland cement modified with 400 pounds of bentonite (12 pounds per sack) and 19¾ pounds of calcium lignosulfonate (0.6 lbs. per sack of cement for well temperatures from 140-180° F.).

If the modified cement composition is mixed in a 13.2-pound-per-gallon slurry, approximately 11¼ barrels of cement slurry will result. (1.93 cubic feet of 13.2-pound-per-gallon cement slurry per sack of cement.) About 7¾ barrels of cement mix water will be needed. (1.44 barrels of 13.2-pounds-per-gallon cement slurry requires one barrel of mix water.)

A 30-minute API filtration test of a slurry containing about 12 pounds bentonite and 0.5 pounds calcium lignosulfonate per sack of regular portland cement shows a filtrate loss of about 100 cubic centimeters.

Setting Up For Squeeze Cementing. In setting up for squeezing, the tubing extension is run in the hole with an extension hanger running tool. Length of extension pipe is determined by the distance from the extension hanger landing nipple and that point in the bottom of the hole where cement is to be spotted.

A pressure test of the tubing will indicate when the extension hanger has been seated in the landing nipple. Running tools are removed and the blind box run in.

After checking pumpability by squeezing salt water through the perforations, cement is mixed. This mixture will ordinarily contain from 30 to 50 sacks of common portland cement and the proper amount of calcium lignosulfonate (expressed as pounds per sack of cement). Resulting cement slurry should weigh between 12.7 and 13.6 pounds per gallon.

After mixing, the cement is circulated down the tubing with the tubing extension set immediately above the top of the perforations or to the desired total depth. When cement has been spotted on bottom, it is squeezed into the perforations by using the "bradenhead" squeeze method. In this type of squeeze, the casing flow valves are closed and pressure applied down the tubing.

Pumping should be slow to allow time for the formation to absorb any trapped salt water and additional fresh water from dehydrating cement without fracturing the formation. A casing pressure gauge should be the reference gauge since it indicates the formation squeeze pressure above a constant salt water pressure gradient. Once a pressure build-up is experienced, holding pressure on the cement may be advisable to permit further dehydration. Squeeze pressures usually average between 1000 and 1800 psi. However, success of a cement job has been found to be independent of squeeze pressure since formation fracturing is avoided.

To accomplish a constant final squeeze pressure, the hesitation squeeze method may be used. Cement is squeezed in, pumps stopped for a few minutes, then more cement pumped slowly in, and the process repeated several times until a final pressure is constant.

After pressure is obtained, excess cement is reversed out. When reversing out excess cement, the pumping pressure should be kept below the final squeeze pressure to avoid fracturing the cement. Normally, a satisfactory cement job is obtained with from 5 to 20 sacks of modified cement. The excess volume used serves as a safety factor in displacing the cement on bottom.

After cementing, a pulling tool is run and tubing extension retrieved. While retrieving this tubing extension, it is usually desirable to reverse circulate at a relatively low rate in order to assist raising the aluminum string.

If the extension is difficult to pull, an "extractor" may be run with a pulling tool which shears downward and carries a testing prong. The extractor seals off the tubing against casing pressure from below, and the extension may then be pumped to the surface while the wire line operator maintains a tight line to avoid kinking. It is important to choke the tubing when employing an extractor because the extension may be pumped up too fast and foul up the wire line.

Perforating equipment is run through a lubricator and the desired interval perforated as previously described. If a permanent record of the relative position of the tubing extension hanger to known casing collars has not been made, a log should be made on the same run to perforate the well.

Working Over Pumping Well. Wire line workovers on a permanently completed pumping well without a tubing packer is quite similar to working over a simple flowing well. Salt water is circulated into the well. Rods and pump are pulled, and wire line equipment set up.

Tubing is checked for mashed or kinked joints by running the paraffin cutter. Wire line measurements are made by the locator tool to correlate well bottom, bottom of tubing and extension hanger landing nipple. If fill up is objectionable, it may be washed out as described above.

Squeeze cementing a pumping well without a packer is identical with squeezing a flowing well of normal pressure gradient without a packer.

After cement has been allowed to set, the job may be tested by removing the fluid head. This may be done by running the rods and pump back into the hole, or fluid may be swabbed out. If the job is satisfactory, rods and pump are pulled if they have been used.

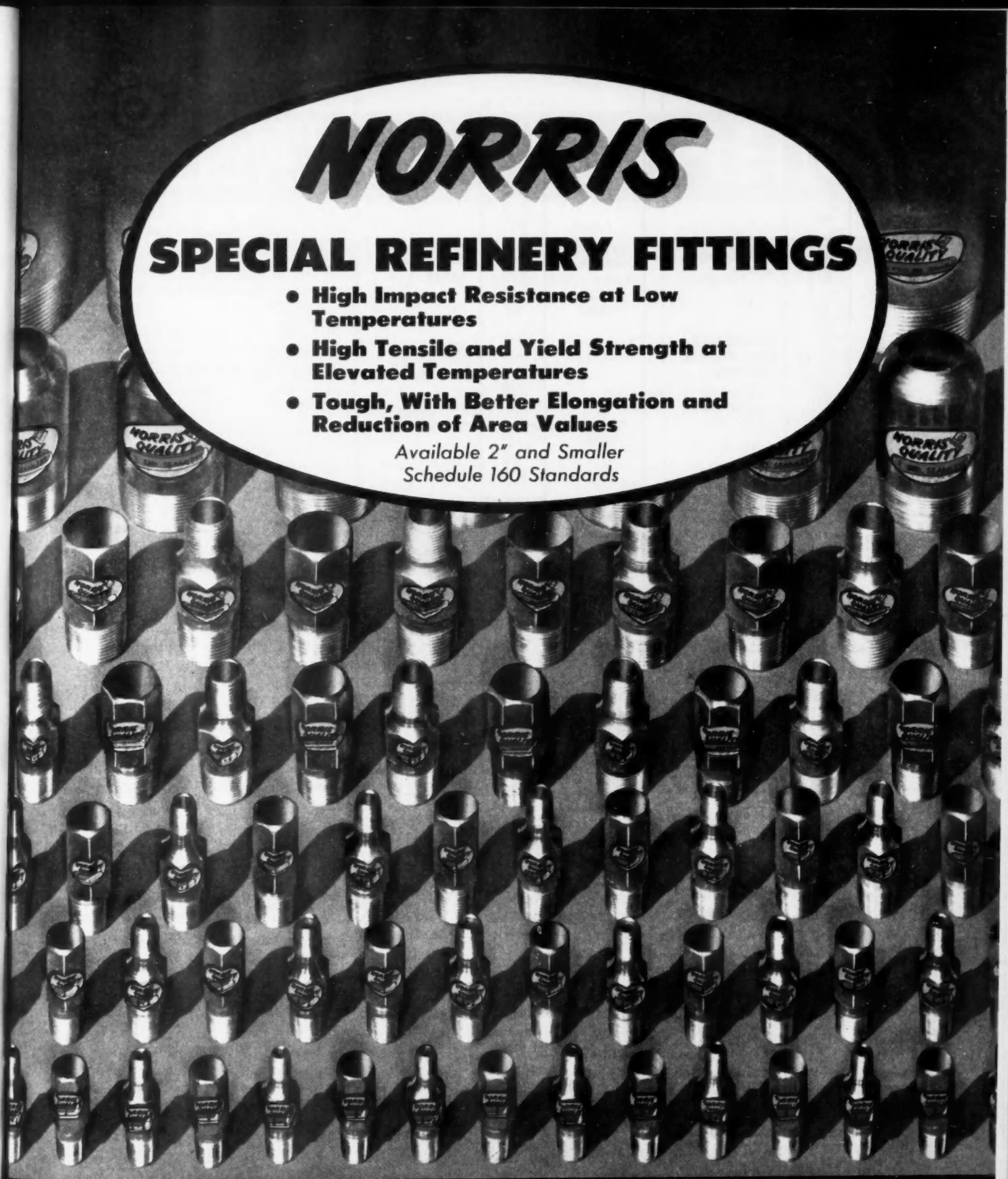
Desired hydrostatic head is spotted in the well and a tubing-type gun perforator run. This perforator is 1 11/16 inches O.D. for 2-inch tubing so it will pass the bored out landing nipple which also serves as a pump seating nipple. In 2½-inch tubing, a 2 3/16-inch O.D. gun is

NORRIS

SPECIAL REFINERY FITTINGS

- **High Impact Resistance at Low Temperatures**
- **High Tensile and Yield Strength at Elevated Temperatures**
- **Tough, With Better Elongation and Reduction of Area Values**

Available 2" and Smaller
Schedule 160 Standards



W.C. NORRIS, MANUFACTURER, INC.

TULSA, OKLAHOMA

WEST COAST DISTRIBUTORS:
REPUBLIC SUPPLY COMPANY OF CALIFORNIA,
Los Angeles

Since NORRIS 1882

BRANCHES:
HOUSTON, KILGORE, ODESSA, TEXAS;
SALEM, ILLINOIS; CASPER, WYOMING

EXPORT: 30 ROCKEFELLER PLAZA, NEW YORK CITY

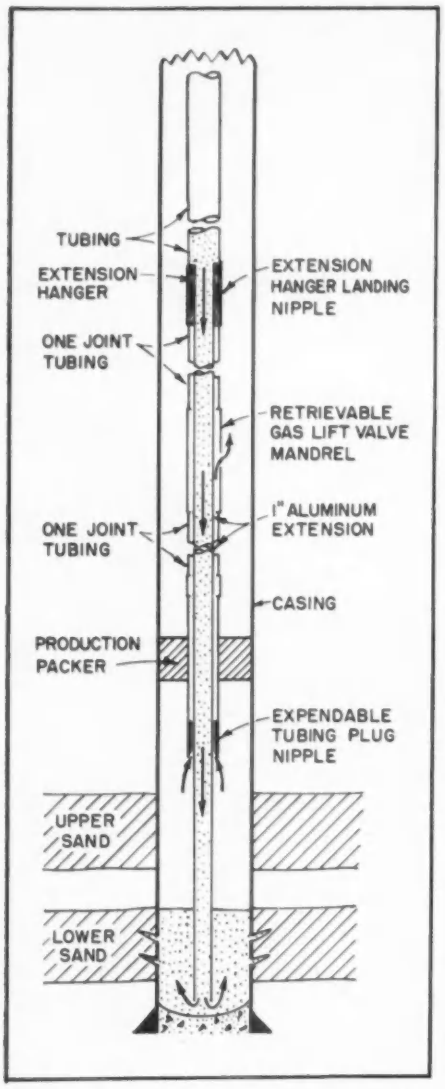


Fig. 12—Spotting cement down extension pipe in flowing well.

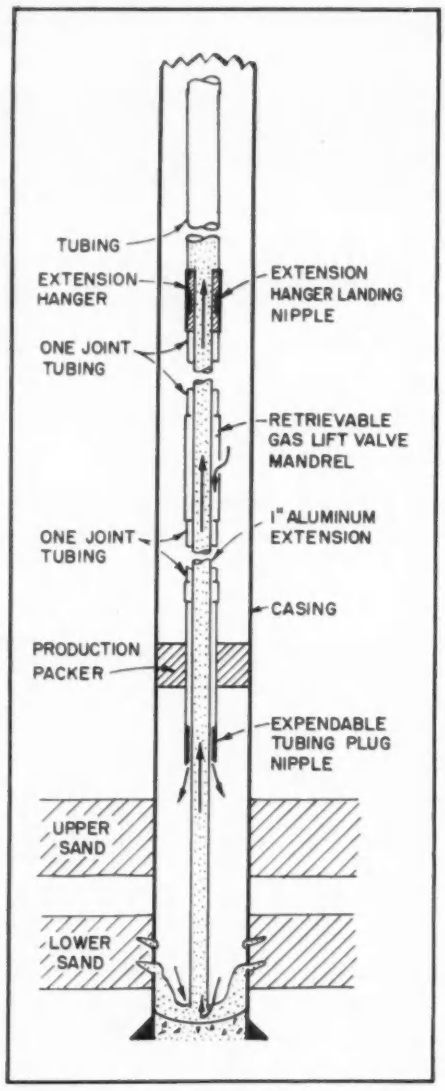


Fig. 13—Reverse circulating to remove excess cement after squeeze job.

run. In each case, the gun will pass through the pump seating nipple.

When the well has been perforated, rods and pump are rerun, and the well placed back on production. Since a pulling unit is required in working over pumping wells, savings are not as large as in the case of other type wells.

Working Over Flowing Well Equipped With Packer. Need for means of communication between the tubing and casing annulus adds several steps to the workover operation on a well of this type. It is assumed that the pressure gradient is not greater than that of average salt water.

The well may be killed by pumping salt water down the tubing, forcing well fluids back into the formation, provided the formation will take it. If the permeability is such to preclude this, the dummy valve in the offset mandrel is removed, or the circulating valve opened. Salt water now may be circulated into the well to kill it.

A swage type gauge is desirable if the offset type mandrel is in the tubing string. The "biscuit cutter" paraffin knife tends to hang up on this type mandrel. If the string is equipped with a circulating valve, the paraffin knife may be run.

If an offset type mandrel is used as a means of communication between the tubing and casing annulus, the dummy valve in the mandrel pocket is pulled. If a circulating valve is used, the shifting tool is run and the valve opened.

Contents of the casing annulus are displaced by pumping salt water into the casing. Circulation should proceed slowly to prevent pumping fluids back into the formation, thereby running the risk of covering the perforations with a mud cake. Mud on the sand face makes it more difficult to obtain a good squeeze job.

This possibility has been eliminated by running a retrievable tubing plug which seats in the tubing plug landing nipple located below the gas lift valve mandrel. This plug is seated prior to establishing communication between tubing and annulus. With the plug in place, heavy muds, or inhibitors, as the case may be, are circulated from the annulus. The plug blocks flow below it, thereby protecting the perforations. With the hole filled with salt water, the plug is retrieved.

If a bradenhead squeeze is to be performed, a circulating dummy valve is run in the offset mandrel. For a packer squeeze, a dummy with a double reverse flow check is inserted in the mandrel pocket. In the case of a circulating valve, it must remain in the open position for a bradenhead squeeze.

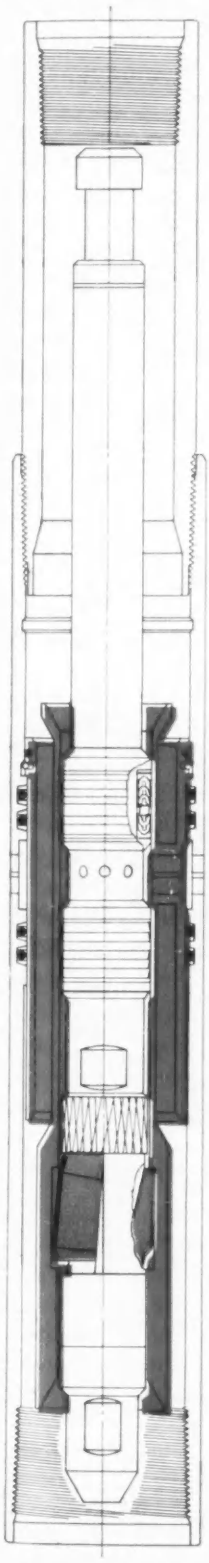
Bottom of well, tubing bottom and extension hanger landing nipple are correlated with a locator tool. These measurements may be correlated with radioactivity logs or other well logs to determine length of extension pipe needed.

Extension pipe is run in the well and seated in the landing nipple. The extension hanger running tool contains a sealing prong which blocks flow through the extension pipe. The hanger now acts like a plunger as it falls to bottom, and some of the weight is taken off the wire line. When the hanger is in place, a pressure test on the tubing will indicate whether or not it has been seated properly. The running tool and prong are pulled.

Cement is spotted on bottom by pumping through the extension pipe as indicated in Figure 12. The well is then squeezed until a constant squeeze pressure is attained. Excess cement is washed out by pumping salt water down the casing annulus as shown in Figure 13. Flow is through the tubing passage (offset mandrel or open circulating valve), down the annulus between the extension pipe and tubing, out the end of the tubing, into the bottom of the extension pipe, and up to the surface through

IN PERMANENT COMPLETIONS

WIRE LINE RETRIEVABLE GAS LIFT EQUIPMENT



GOT Type "V" Mandrel, with Type "V" Gas Lift Valve locked in position.

TYPE "V" SLEEVE VALVE MANDREL

This equipment is designed for those permanent completions where conditions permit the tubing to be left in the hole for indefinite periods.

The sleeve of this mandrel is 1⅞" I.D., and has a full-flow by-pass around it. The outside diameter of the mandrel is 4⅛". The gas lift valve sets inside the mandrel, locked in position by dogs that engage a recess in the sleeve. This mandrel is normally furnished with O-Ring seals that are backed up and enclosed with Teflon rings. This packing arrangement has proved to be reliable and durable in over two years field service. When desired, the mandrel will be furnished with chevron packing.

The Type "V" Gas Lift Valve that is designed for this mandrel consists of any standard type of GOT valve combined with the "V"-type valve assembly. This assembly contains chevron packing rings that seal inside the sleeve, and two sets of dogs that lock the assembly into the sleeve. As run in the hole with standard Otis tools, the downward facing dog is retracted, permitting the valve assembly to pass freely through the mandrels. To set the assembly, it is first run through the selected mandrel, then pulled up until the active upward-facing dog engages the recess in the sleeve. A strain on the wire line then frees the downward-facing dog, which engages in the same recess but in the opposite direction, thus locking the gas lift valve assembly in its proper position inside the sleeve.

Jarring down then shifts the sleeve to the "open" position and simultaneously frees the Otis tool, leaving the gas lift valve in operating position. Gas lift valves are thus interchangeable for any mandrels in the string.

Since the gas lift valve assembly is concentric with the tubing, a regular Otis wire line fishing tool will retrieve it even in wells that are off vertical. Jarring up first closes the sleeve valve; further upward jarring then shears a pin in the upward-facing dog, which is then spring-retracted to allow the valve assembly to be lifted free. The sleeve always moves to the "closed" position before the pin shears, so that undesired communication between casing and tubing never occurs.

It is unnecessary to equalize pressures, and only one trip with the wire line is required to install or remove a valve.

By shifting the sleeve valve with the GOT Shifting Tool, the Type "V" Mandrel can also be used for circulating, reverse circulating, acidizing or other operations requiring communication between the casing and tubing.

TYPE "S" SLEEVE VALVE MANDREL

For "slim hole" completions, a unit similar to the Type "V," but with an outside diameter of 3⅜", will also be available.

ADVANTAGES

1. No undesired communication between casing and tubing ever occurs.
2. It is unnecessary to equalize pressures before pulling a valve.
3. Mandrels are sturdy, compact and completely non-corroding. Type "V," 4⅛" O.D., 32" long; Type "S", 3⅜" O.D., 18¼" long.
4. Welding has been entirely eliminated.
5. Concentricity minimizes erosion, insures freedom from sand, silt, etc. deposit, and facilitates engagement by fishing tool.
6. The simultaneous closing of the sleeve when a valve is pulled eliminates an extra trip per valve.
7. With complete interchangeability and minimum initial investment required in mandrels, many years of changing production requirements can be anticipated with the greatest economy.

"For complete information on this most efficient and economical Permanent Completion Equipment, contact your nearest GOT representative or write to us."

got

Garrett Oil Tools, Inc.

P. O. BOX 2427 LONGVIEW, TEXAS

the tubing. When return wash water is free of cement, the extension pipe is pulled. After the cement has set, the squeeze job is tested by swabbing down the tubing.

Either mud or chemical inhibitors (or other preferred fluids) are circulated into the casing annulus. Inhibitors can be used only if the retrievable gas lift valve mandrel is in the string, since an injector valve is needed. This type valve is run in after the chemicals are spotted in the annulus. If mud is used, the tubing passage is closed off.

The desired fluid head for perforating is placed in the tubing, and the well perforated as outlined previously. A collar log made during the perforating run will permit accurate placement of the gun.

If the well does not flow, it is swabbed in.

Use of Tubing Plug and Plug Nipple. In order to keep perforations as clean as possible for better squeeze cementing, a tubing plug may be used. This plug prevents the mud from dropping to bottom and contacting the perforations.

The plug is retrievable and seals in a seating nipple located just above the packer. This seating nipple is similar to the extension hanger nipple. The plug blocks the tubing below the mandrel or circulating valve (whichever is used). Before circulating out mud from the casing annulus, the plug is run. It is pulled when the mud has been displaced with salt water. It is optional, but is helpful in cases where formation permeabilities are such that they will take fluid easily.

Working Over Permanently Completed Gas Lift Wells. Before going into a gas lift well equipped with a packer, the gas supply line must be closed and all pressure bled off the casing and tubing. Wire line equipment is set up, and the tubing checked for restrictions. If the well is equipped with offset type mandrels, the biscuit cutter type paraffin knife should not be run, for reasons explained earlier. The swage type gauge is used in this case. If sliding sleeve type mandrels are in the string, the retrievable gas lift valves in these mandrels must be pulled before the tubing can be gauged.

If offset type mandrels are used, next step is to pull the gas lift valves and replace them with dummies. The lower mandrel just above the packer remains open if a bradenhead squeeze is contemplated. To keep this lower mandrel free of debris and eliminate chances for hanging up wire line tools in the mandrel pocket, a circulating dummy is run.

If a packer squeeze is to be made, a circulating dummy with a double reverse flow check valve is used. Flow through this check valve is from the annulus into the tubing only.

Since the sliding sleeve type mandrel closes automatically when the valve is pulled, the lower mandrel just above the packer may be opened by use of a shifting tool. In either hookup, communication between the annulus and tubing is established.

Salt water is circulated to fill the annulus and tubing. As a practical note, the flow line to the tank battery may be used to carry formation salt water from the gun barrel back to salt water storage tanks at the well site.

If an objectionable amount of fillup is noted when running the locator tool to establish wire line measurements, this fillup may be washed from the well by employing procedures outlined earlier.

Squeeze cementing a perforated interval in a gas lift well is practically identical with squeezing a flowing well equipped with a packer. It may be a bradenhead squeeze where the casing is closed off and pressure applied down the tubing, or it may be a packer squeeze. In the latter type, fluids in the tubing and below the packer are squeezed into the formation ahead of the cement.

Cleaning out the well is also identical with the packed off flowing well, and tools are removed in the same manner.

When cement has set, pressure on the casing (or tubing for a packer squeeze) is released. Dummy gas lift valves in the offset mandrels, including the circulating dummy in the lower mandrel, are pulled and replaced with conventional gas lift valves.

The squeeze job may be tested by jetting out all salt water in the casing and tubing down to the lower valve, thereby placing a maximum pressure differential across the cemented perforations. If the cement holds, the lower gas lift valve is removed and salt water circulated into the well to build up a desired hydrostatic head for perforating. A conventional gas lift valve is run back in the lower mandrel.

If gas lift gas is not available during this stage, the cement job may be tested by swabbing fluid from the tubing. When offset type gas lift mandrels are used, a double swab assembly containing a spacer bar ten feet long is required.

The well is perforated in the same manner as any permanently completed well is perforated.

To gas lift a well equipped with sliding sleeve mandrels, all conventional gas lift valves must be run back in the well. In the case of a well equipped with offset type mandrels, the well is ready for gas lifting immediately following perforating.

Abnormal pressure wells . . .

WELLS WHICH have a pressure gradient greater than that of average salt water may be worked over by using special pressure control equipment. This is a flowing well and generally equipped with a packer. Use of the expendable aluminum tubing plug (previously shown in Figure 2) is essential in abnormal pressure wells. Additional expense of the tubing plug seating nipple is so small that most flowing wells are equipped with one just in case it should ever be needed.

The well is shut in and wire line equipment rigged up. The biscuit cutter paraffin knife is run to check tubing for mashed joints or kinks. A locator tool is run, and the dummy valve in the offset mandrel (if used) is pulled, or the circulating valve opened.

Tubing pressure is bled down and contents of the casing annulus are circulated from the well with salt water.

The expendable aluminum tubing

plug is run on wire line and set in the seating nipple on bottom of the tubing. It is designed to retain any pressure differential which might exist on the well head after the well has been circulated with salt water.

Before the expendable tubing plug running tool is released, surface pressure is reduced by not more than 500 pounds per square inch. After the running tool has been released and lifted to the surface, tubing pressure is bled off completely.

The required length of extension tubing is run in. Bottom of the extension contains an aluminum plug held in place by shear pins. This plug prevents flow through the extension should an emergency arise and the extension pipe must be supported in the blowout preventer. It also allows the one-inch aluminum extension pipe to float into the well, relieving some of the strain on the wire line. The seal prong in the hanger running tool is omitted, leaving the extension hanger open.

As the extension pipe nears tubing bottom, pump pressure is applied to the tubing and the expendable aluminum tubing plug blown out. The extension hanger is seated in the landing nipple, and pressure again applied to the tubing to blow out the plug in the extension hanger.

To pressure test the tubing, the seal prong is carried in on the hanger running tool. With the tubing sealed off at the extension hanger landing nipple, a pressure test can be made. After the test, tools are withdrawn and the well is ready for squeeze cementing.

The well may be squeeze cemented in the same manner described earlier. *Care must be exercised when circulating or reverse circulating to maintain a back pressure sufficient to prevent flow of formation fluids into the well bore.*

By maintaining this back pressure, back flow of cement from the perforations is prevented.

While pressure is maintained on the wellhead, the tubing extension is pulled with the pulling tool equipped with a seal prong. It seals the hanger so that reverse circulation may be applied to aid lifting the extension pipe. The extension pipe is pulled up into the lubricator and blowout pre-

Flexite Plungers are easy to make up in the field because they can be quickly assembled without special equipment or trained personnel. Flexite Rings are precision ground for an exact fit in the barrel tube, and do not require soaking or prefitting. They are made of a hard, tough, plastic composition impregnated with graphite for self-lubrication and will not swell or corrode. The sealing action of Flexite Plunger Rings is obtained by a built-in inner tension in the step-cut design. This allows them to expand to a tight fit against the barrel tube wall under pressure of the fluid load. Upon reversal of the plunger stroke the rings take up and release the load gradually, thus eliminating sudden shock and stress on the rod string.

Complete Flexite Plunger assemblies are available in 20- to 60-ring lengths for all A.P.I. rod or tubing pumps. The next time you set a pump in a deep or hard-to-pump well, run in a Flexite Ring Plunger. You'll like the way you will get full production with a minimum load on your power unit.

Flexite Ring Plungers and other H-F production equipment are sold from stock by leading stores throughout the oil country.

Harbison Fischer Ft. Worth

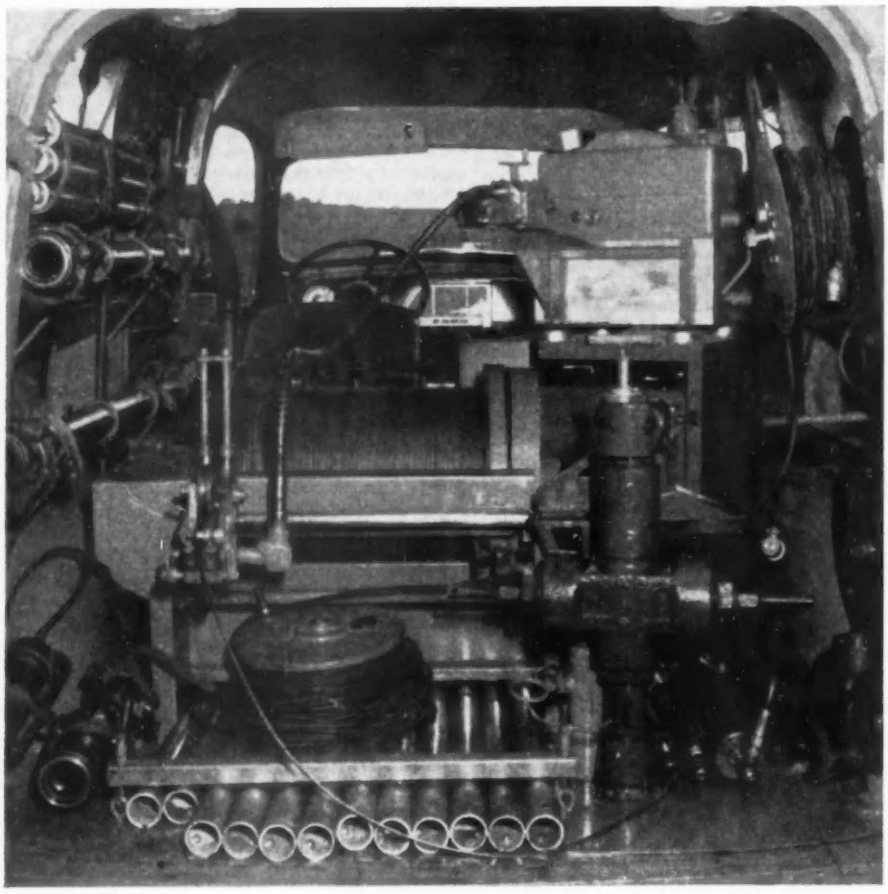
(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

venter closed tightly around it while cement sets.

When the cement has hardened, pressure is bled from the tubing to check effectiveness of the squeeze job. There should be no flow from tubing.

The lubricator is broken down and extension pipe disassembled. Bottom of the hole may be checked to insure that cement has been washed out to the desired depth.

Mud and chemical inhibitors may be placed in the casing annulus by using the same procedure discussed earlier. Perforating the well and placing it back on production is also similar as previously described for flowing wells.



WORKING END of a tubing-type gun perforator truck. All necessary equipment, including casing collar logging instruments, are carried on small panel trucks such as this.

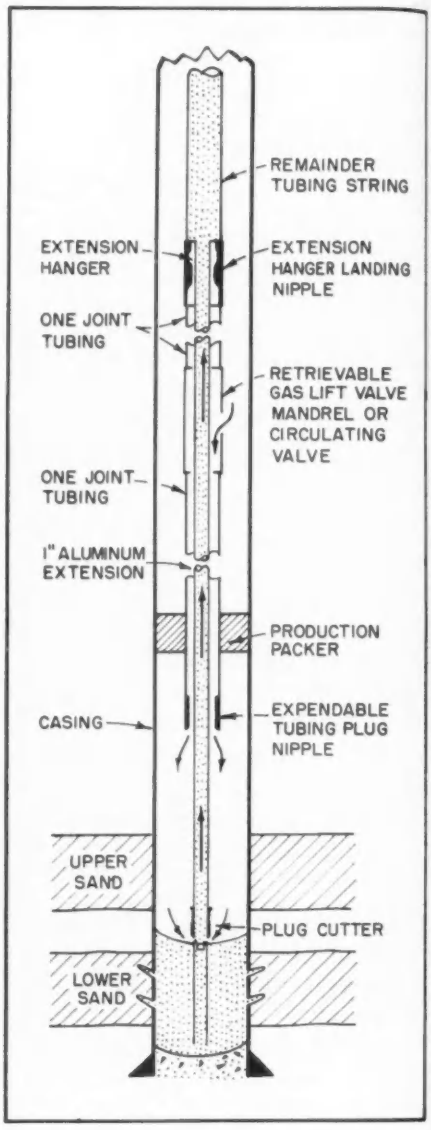


Fig. 14—Plug cutter in extension pipe string cuts cement plug by reverse circulation.

Plug cutter big aid in cementing . . .

THERE ARE WELL conditions which make it desirable to squeeze off perforations and leave them covered with a solid cement plug on bottom. If the end of the extension pipe is near well bottom during the squeeze job, all cement in the bore is washed out when excess cement is removed by reverse circulation. When the end of the extension pipe is placed just above cement plug depth, the cement must fall through a column of salt water to fill up the hole. Experience has shown that the plug will usually contain pockets.

This problem has been solved completely by using a device called a "plug cutter" which is a part of the extension pipe. Basically, the plug cutter consists of two check valves: one is a conventional drop-type velocity check; the other is a sliding sleeve check that utilizes an unbalanced area principle.

When circulating through the tubing, the velocity check is opened and the sleeve check remains closed. Cement or other fluids may be displaced out the lower end of the tubing extension. When reverse circulation is established, the reverse check closes and the sleeve-type check opens. Fluids and excess cement flow into the extension pipe through the plug cutter.

Location of the plug cutter in the aluminum extension is determined by the depth of the desired cement plug. End of the extension hangs just off well bottom. Top of the cement plug will be near the plug cutter, possibly one or two feet below it, as shown in Figure 14.

It is particularly useful in plugging off formations of very low permea-

bility which cannot be pumped into easily at low pressures. Cement can be spotted opposite the perforated interval to a point above the plug cutter. After squeezing, cement is reversed out down to the plug cutter. The entire tubing extension string is retrieved with wire line, leaving a solid plug of the desired length in the casing.

A safety adapter on the bottom of the plug cutter contains shear pins. If the extension cannot be pulled from the cement plug after the squeeze job, an upward blow with wire line jars will shear these pins, releasing the extension pipe above the plug cutter.

Use of Caustic and Inhibited Acid. In cementing abnormal pressure wells, an aluminum tubing plug and an aluminum extension plug are left in the hole. When an expendable tubing-type gun perforator is used, parts of the aluminum gun body are also left in the well. If these aluminum pieces are undesirable, they may be dissolved by spotting caustic solutions on bottom through an all-steel extension pipe.

Should the top of the cement plug be higher than anticipated, inhibited mud acid to dissolve the cement can be pumped through the all-steel extension pipe equipped with steel telescoping joints. Small ports in the end of the extension pipe jet acid directly against the cement plug. Feasibility of using acid to dissolve cement has been indicated by very limited field experience.

Permanently completing dual flowing wells . . .

DUAL PERMANENT completions differ from single permanent completions in that two zones are produced separately through the same well bore. However, the term "permanent completion" applies only to those zones which are located below the lower end of the tubing and not to the upper zone which is located above the lower packer. These lower zones are squeezed and perforated in the same manner as those of single permanent completions. Difference is that the upper zone must be isolated during the squeeze operation.

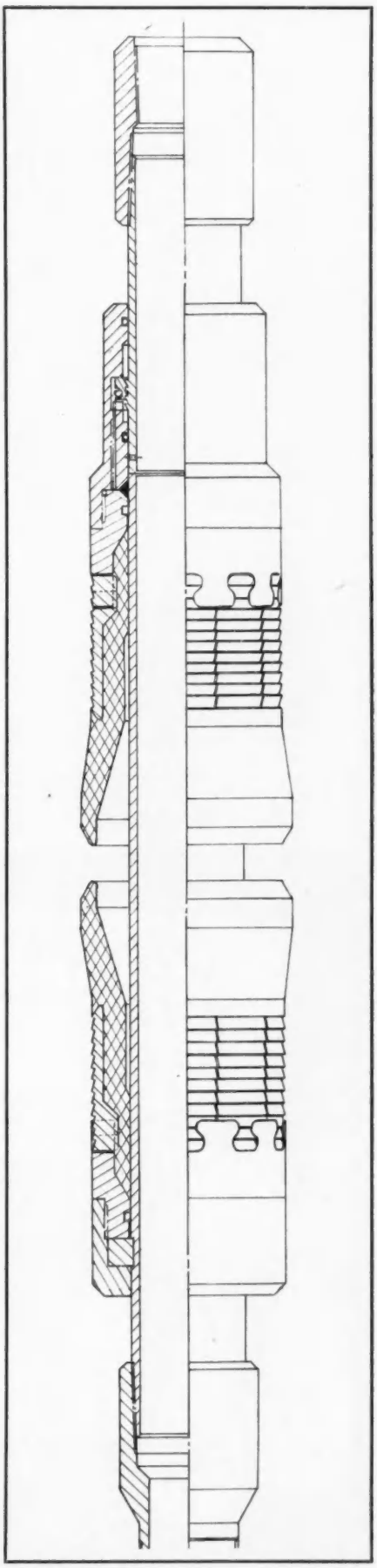
Procedures and equipment described below apply only to flowing wells. However, it is anticipated that by mid-summer this year, equipment will be in the field to test a newly-developed system for permanently completing dual gas lift wells.

As in the case of single permanent completions, there are prerequisites which must be satisfied in order to permanently complete a dual flowing well. In addition to those outlined for single zone producers, the following factors must be considered for dual producers:

1. Upper packer must be placed just above the upper zone. The lower packer must be placed below the upper zone and located so that the lower end of the tubing is above any potential producing intervals.
2. Upper zone must be perforated before the tubing is installed. Tubing cannot be run in while waiting on casing cement to set, as in the case of single permanent completions.
3. The lower zone may be perforated either before or after the rig is released. To perforate after the rig has been moved off, the tubing-type gun is required.
4. This method has been used satisfactorily in wells of normal pressure gradient only.

Extra Equipment Required. Additional equipment for a dual permanent completion of a flowing well include these major items: (1) two full opening packers which require little weight to set; (2) a polish nipple; (3) by-pass nipple similar to a side-door choke nipple; (4) flow collar, which is not a regular flow coupling; (5) side port nipple that differs from a side door choke nipple; and a tubing extension hanger landing nipple which will seat the regular flow choke, the crossover flow choke or the extension hanger.

Controlling Flow. With the installation of this equipment, regular or



NEW DOUBLE, opposing cup-type packer that has proven particularly suited to dual permanent completions. It is short, full opening, and seals from both sides.

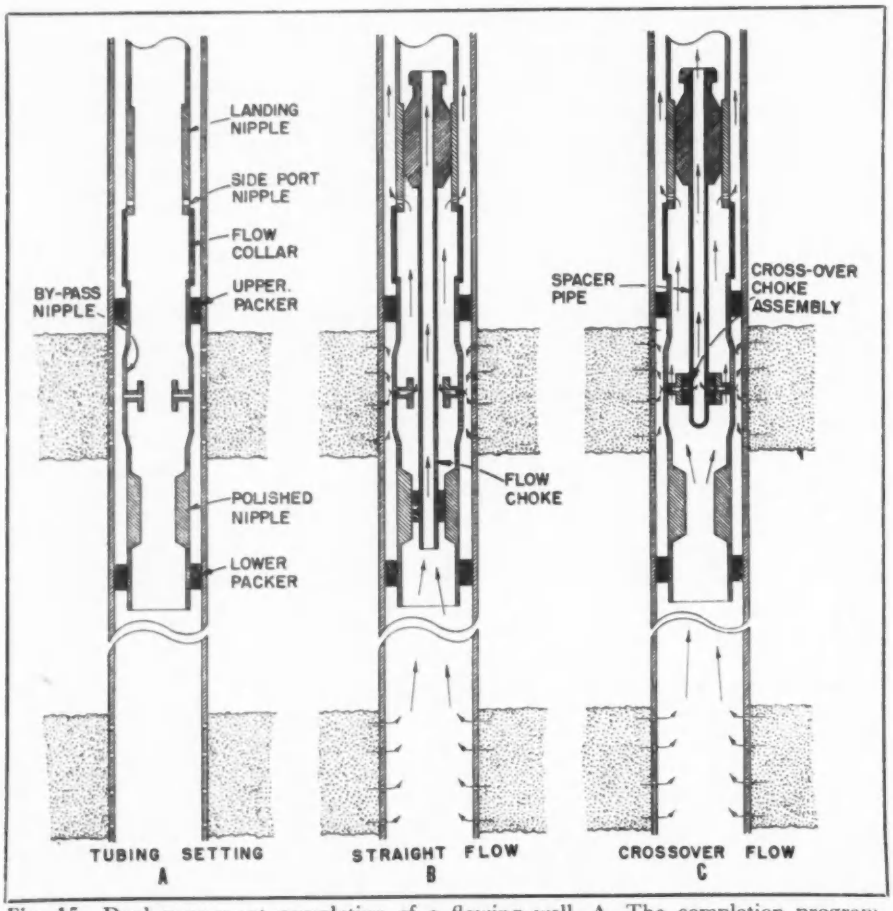


Fig. 15—Dual permanent completion of a flowing well. A. The completion program, showing tubing setting. B. Hookup for straight flow through flow choke. C. Hookup for cross-over flow.

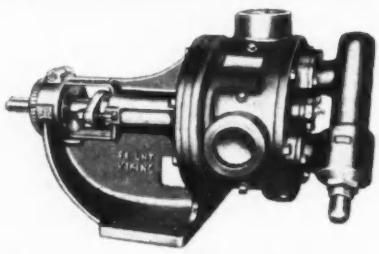
crossover flow is optional through the use of certain tools that may be run in the well with wire line. The side port nipple provides an outlet for the selective crossover feature during normal well operations, but provides communication between the tubing and tubing annulus during workover operations so that circulation may be established. This nipple also accepts the spring actuated ring check valve used in a packer squeeze or in reverse circulation only.

The flow collar provides a by-pass chamber for the ring check assembly which will be used on the extension hanger when a packer squeeze is performed. This ring check will be located in the lower end of the side door nipple to prevent tubing-to-casing communication during such a squeeze, but will allow casing-to-tubing flow to reverse out excess cement. In such cases, the ring check will be depressed to a position within the flow collar where ample clearance is provided for circulation.

The by-pass nipple is located between the two packers and resembles a side door choke nipple but does not contain a locking recess. This nipple forms the lower or inlet portion of

KEEP YOUR WATER SYSTEM FREE!
PUR-O-SAN
the complete intake water conditioner FOR SECONDARY OIL RECOVERY
INCREASES INTAKE RATE!
PREVENTS PLUGGING!
PREVENTS CORROSION!
NON-POISONOUS!
READILY SOLUBLE!
PUR-O-SAN COMPANY
DIVISION OF BRADFORD CHEMICAL CO., INC.
20 Congress Street • Bradford, Pa.

VIKING
Truck Mounting
PUMPS



The new improved Viking Truck Mounting Pump incorporates outstanding features: an improved bracket base with extra long packing chamber; a new style double supported valve on head; a revolvable type pump case which allows complete selection of ports. Available in units from 35 GPM to 300 GPM sizes. Write for literature.
Distributor
SOUTHERN
ENGINE & PUMP COMPANY
MANUFACTURERS • MACHINERY FACTORS • CONTRACTORS
Houston — Dallas — Kilgore — San Antonio
Edinburg — Corpus Christi, Texas
and New Orleans, Louisiana

PAGE* TYPE "J"

INSERT PUMP ANCHOR

1. **NO ROUND TRIPS TO CHANGE PUMP POSITION**
2. **NO PREMATURE SETTING**
3. **RUGGED PACKER ELEMENT**

The Page type "J" Pump Anchor eliminates the cost of pulling tubing every time the pump position is changed. In fact, the pump and anchor can be picked up and repositioned while by-passing the fluid.

The setting and unsetting operation is simple and positive. TO SET: Pick up the rods the length of the pump to engage the clutch in upper part of the pump. Torque the rods to the left and then lower, applying all the rod load to the Anchor. This sets the packer, slips and split cone simultaneously. Now, space the pump. IMPORTANT: Pump must have an internal clutch.

Incorporated in the Page type "J" Insert Pump Anchor is an exclusive pack-off which permits resetting without replacing packer. Unique Page design eliminates cold flowing or extrusion of the rubber packer.

Available in 2", 2½" and 3" sizes. Write or wire for prices and delivery.

* Registerd U. S. Patent Office

PAGE TENSION TOOLS

PAGE

OIL TOOLS, INC.

3356 LIME AVENUE
LONG BEACH 7, CALIF.

DISTRIBUTORS: Emsco Manufacturing Co., Los Angeles, Calif. and Garland, Texas. All Field Stores.
The Continental Supply Co., Continental Bldg., Dallas, Texas. All Field Stores.

EXPORT: The Continental Supply Company, Inc.
30 Rockefeller Plaza, New York 20, N.Y.
All Field Stores.

the selective crossover feature and, during crossover flow, houses the lower packing section of the crossover choke.

The polish nipple is made up into the lower end of the by-pass nipple and contains the lower packing section of the regular flow choke to provide parallel flow.

The lower packer may be installed any distance below the polish nipple. Figure 15A illustrates diagrammatically the completions program of a flowing well utilizing this system.

Regular or Straight-Through Flow. For straight-through flow, as indicated in Figure 15B, the regular flow choke assembly is used. Flow from the lower zone is up the center of the regular flow choke and tubing in exactly the same manner as in conventional, non-selective dual completions.

Flow from the upper zone passes through the side port of the by-pass nipple into the annular space between the spacer pipe and the tubing, through the ports of the side door nipple and out into the casing annulus where it continues to the surface.

Crossover Flow. With the crossover flow choke installed as indicated in Figure 15C, production from both zones follows separate flow courses: (a) Flow from the lower zone passes up the tubing and through the polished nipple, through the annular by-pass area of the by-pass nipple, through the spacer pipe-tubing annulus to the side port nipple. From here, it passes out of the tubing through the lateral ports into the casing annulus and on to the surface. (b) Flow from the upper zone enters the side port of the by-pass nipple, is directed up through the bore of the crossover choke assembly, and then through the tubing to the surface.

Working Over dual permanent completions . . .

THE SAME GENERAL equipment used to work over single permanently completed wells is required for dual installations of this type. The extension hanger and related equipment will differ somewhat.

Displacing Well Fluids. Contents of the tubing and casing are displaced with salt water by pumping into the formation, and the surface pressure reduced to zero. If well fluids are to be displaced by reverse circulation, the regular or crossover choke must be pulled. Wire line measurements of well bottom, and the end of the tubing are correlated by running the locator tool.

Running the Extension Pipe. Desired length of one-inch aluminum extension pipe is run in on the extension hanger. If a packer squeeze is contemplated, a ring check valve is installed between the two packing sections of the extension hanger. If the tubing extension is plugged on the end with an aluminum plug, it is blown from the extension and the seal prong on the hanger running tool inserted into the hanger. The tubing may be pressure tested. If this extension plug is not used, the hanger

KIMCO

2½" BLOWOUT PREVENTER

10,000 LBS. TEST

Designed and manufactured specifically for wire line workover methods in *a complete range* of sizes. It is approved and accepted as the exclusive tool for this purpose.

Write today!

P. O. Box 5236, Houston 12, Texas

contains the seal prong which permits pressure testing upon seating the hanger in the landing nipple.

A Bradenhead Squeeze. Cement is spotted on bottom in the usual manner by pumping it down the tubing and out the extension pipe. Fluid in the well is displaced up in the tubing annulus to the ports of the side door nipple, and through the casing annulus to the surface. The casing is closed and the well squeezed by applying pressure on the tubing. Figure 16A illustrates a bradenhead squeeze.

A Packer Squeeze. To treat the formation either by fracturing or acidizing, the ring check valve must be included in the extension hanger. After the hanger and extension are in place, fluid is pumped into the tubing. Since the ring check valve prevents tubing-to-annulus communication, fluids are forced into the formation. Treating fluids are then pumped down the tubing and into the formation. Excess treating fluids may be reversed out. The ring check valve now opens to allow flow from the annulus into the tubing, as shown in Figure 16B. Figure 16C illustrates the reverse circulation procedure.

Check Success of Squeeze Job. When cement has hardened, the extension hanger is run without one-inch aluminum pipe. When seated, the upper zone is isolated, but communication may be established from the casing into the tubing.

Under these conditions, fluids are easily swabbed or otherwise removed from the tubing, reducing the hydrostatic head to check the squeeze job. If the job is satisfactory, the tubing and annulus are loaded with fluid and the hanger pulled. Fluid will control the upper formation so that the hanger will not flow up the tubing when ports of the by-pass nipple are uncovered.

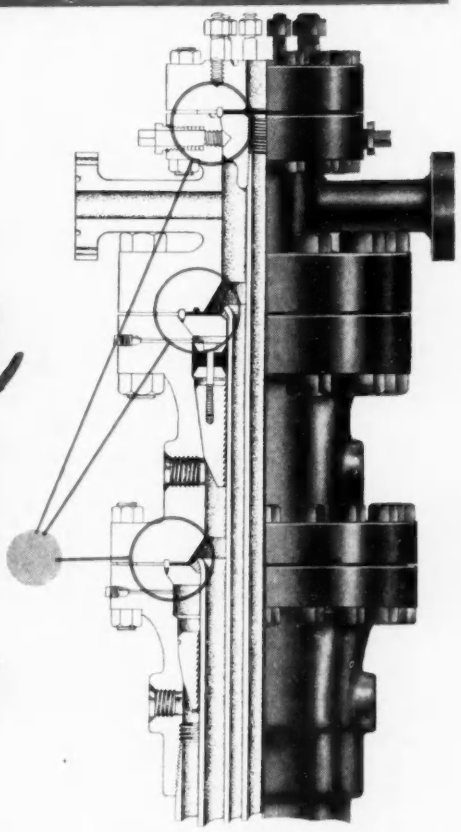
A star drill is run in on wire line to check bottom. The well is ready for perforating in the same manner described earlier.

Placing the Well Back on Production. If desired, a tubing stop may be set near the lower end of the tubing, and should be placed below the by-pass nipple. A regular flow choke is

RECTORHEADS

Seal with Steel all the way

- for Safety
- for Permanence
- for Simplicity



Assembly of Type "RH" Rectorhead Casing Heads with three Casing Strings and Type "M" Tubing Head. Notice how welding ring seats in head body. API Ring Gasket completes the "seal-with-steel."

You wouldn't think of using soft packings between flanges or flanged fittings, particularly where temperatures and pressures are high. Then why use them in casing or tubing heads, where conditions are even more severe, and leaks more disastrous.

When you use Rectorheads you "seal-with-steel." The welded seals, plus API Ring Gasket, never require replacement or maintenance, will not "flow" under high pressure or temperature, will not "freeze" or contract under low temperature, will not burn out or deteriorate. The Rector Welding Procedure is covered in API Std. 6E., Third Edition, January 1952.

Why risk soft seals in your well heads when you don't use them in flanges? Specify Rectorheads and you can "seal-with-steel" between casing strings.

Sold through authorized Supply Stores.

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER

1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTOR METHOD RECTORSEAL

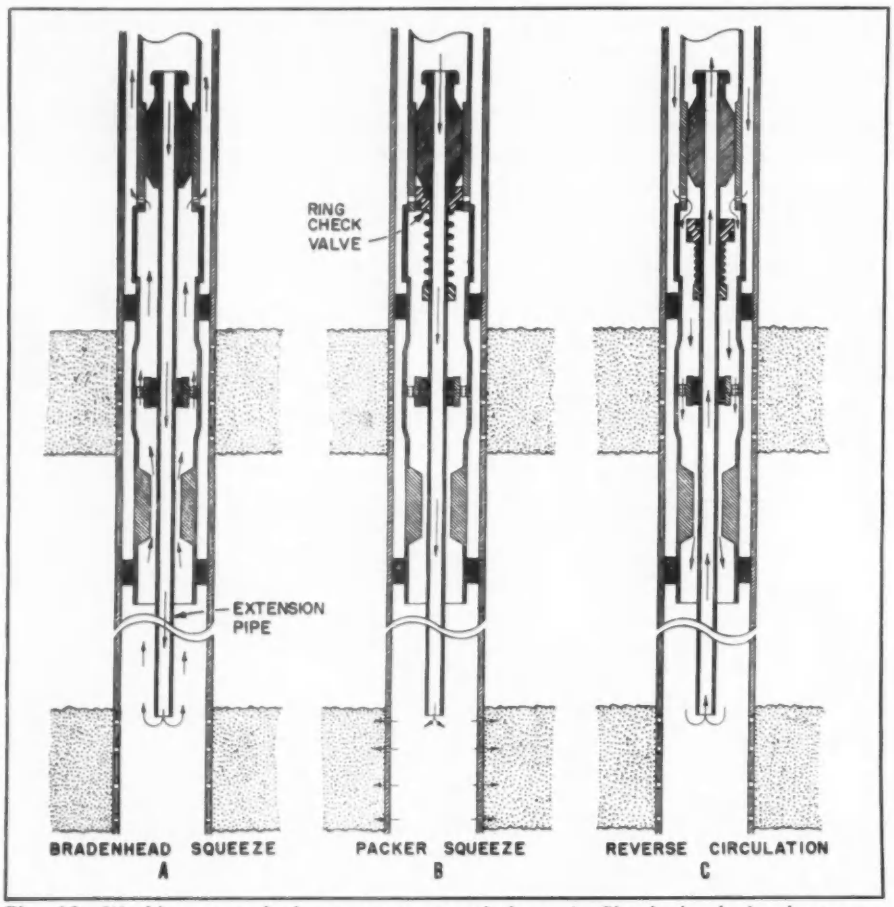


Fig. 16—Working over dual permanent completions. A. Simple bradenhead squeeze. B. Packer squeeze. C. Reverse circulating to remove excess cement.

installed so that the lower zone may be brought in and tested. If the workover is successful, the regular flow choke is pulled. At this point the annulus is full of fluid and the choke should be extracted. If crossover flow is desired, the crossover choke is installed. For straight-through flow, the regular flow choke is run.

Remarkable savings have been made...

IN TALKING about what permanent-type well completions can save for the oil or gas operator, it must be remembered that this new technique is only three years old! Compared to well cementing, the perforating gun, and the rock bit, it is still an infant. In developing procedures (and new things are tried frequently), it is natural that some disappointments occur. However, in most of these cases, the trouble does not lie with the new

Air-powered
TUBING SPIDER
(A Cavins Co. Product)

(Pat. Pend.)

Two of the many reasons why you will be glad to own an
Advance
TUBING SPIDER

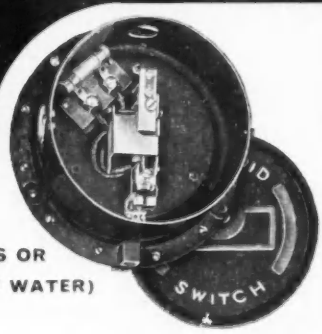
1 **COVERS ALL SIZES:** Made in two sizes. Will handle all single strings from 1¼" tubing to 4¾" OD casing, also all 2-string and 3-string parallel installations.

2 **FOR ROTARY WORK:** May be used on a rotary table with our adapter plate which fits in the master bushing.

Bulletin TS-54 tells the whole story.
We invite you to send for your copy.

Advance Oil Tool Co.
2853 Cherry Ave., Long Beach 6, Calif., Ph. 485-64
Mid-Continent Rep: Hillman-Kelley
Export Rep: Roland E. Smith

DIFFERENTIAL PRESSURE CONTROLS FOR LOW PRESSURES



MERCURY SWITCH EQUIPPED

FOR AIR OR GAS (INCHES OR FRACTION OF INCHES OF WATER)

TO OPEN OR CLOSE AN ELECTRICAL CIRCUIT ACCORDING TO A MINUTE CHANGE IN THE DIFFERENCE BETWEEN TWO PRESSURES OR VACUUMS

Mercoid Type PPQ Diaphragm Differential Pressure Controls operate from minute changes (.03" water) in the difference between two pressures.

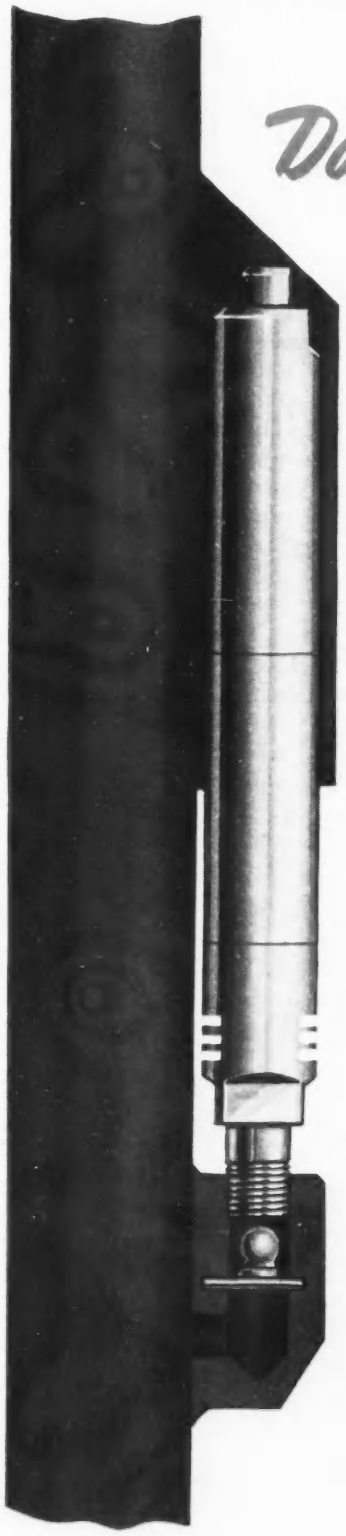
Ranges to cover most applications (inches of water) 6" vacuum to 6" pressure, and 30" vacuum to 30" pressure. Available for various circuit arrangements.

Electrical Capacity—0.3Amp. at 115V., A.C. or 0.15 Amp., at 230V., D.C. Can be furnished in explosion-proof or weather-proof cases.

WRITE FOR BULLETIN CA-3P

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS, U.S.A.

GUIBERSON DOES IT!



Double Duty Type 'A' Flow Valve

With Tungsten Carbide Ball and Seat

produces continuous or intermittent flow with only a surface equipment adjustment

Install Type "A" on any continuous flow operation. When production falls to a level where intermittent flow is required—*a simple surface adjustment* produces well with maximum efficiency and economy. No need to round trip tubing to change valves.

Guiberson Surface Control Equipment...

is designed and built specifically for gas lift. Rugged, weatherproof Type "A" Motor Valve and Time Cycle Controller or Pressure Controller are easy to get to, easy to operate, easy to adjust.

Write today for the new
GUIBERSON GAS LIFT MANUAL

Guiberson Gas Lift Equipment is protected by the following patents:
2,156,429 2,227,132 2,292,768 2,347,620 2,377,981
2,188,636 2,230,107 2,305,250 2,358,944 2,411,315
2,188,668 2,271,859 2,340,028 2,361,718 2,519,242
Other patents pending.

SAVE THAN SORRY GUIBERSON BETTER BE

THE
GUIBERSON
CORPORATION
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.
Sold By Leading Oil Field Supply Stores Everywhere

KENNAMETAL*
Balls and Seats

Kennametal's longer service means fewer string pulls for valve failure — production volume is greater, maintenance costs are less. These sintered carbide balls and seats last up to 5 times longer than "special" alloys in sour crudes, flour sand cut fluids and hydrogen sulfide gases.

Ask your supplier or pump manufacturer about Kennametal Balls and Seats — either flat or rib type. Kennametal Inc., Latrobe, Pa.

KENNAMETAL*
LIGHT-WEIGHT
BALLS

Made of corrosion-resistant titanium carbide, ½ lighter than steel. Minimizes down-well check valve trouble caused by ball flutter, cage wear, and fluid pounding.

KENNAMETAL*
REDUCES THE RISK OF SUB-SURFACE VALVE FAILURE
*Registered Trade Mark

completion method, but with some other phase of production. It is through mistakes that progress is made, and in the years to come, bigger and better things will emerge from further development of permanent completions.

On the black side of the ledger are many successful wells that have brought about considerable savings. To illustrate the brighter side of permanent completions, some typical examples are cited.

There is a considerable difference in a workover bill of $4390 and one of only $1890. Yet, this was an actual case in a 6000-foot well on the Texas Gulf Coast. This well was equipped for a permanent completion and was recompleted. The job included washing out sand from bottom, squeezing existing perforations and reperforating at a higher interval. Total cost as itemized below was only $1890, and it took only four days!

Gang Labor	$100
Pump Truck to Wash Out Sand	210
Cementing Pump Truck	297
Cement and Services	186
Wire Line Truck	257
Perforating (90 shots in 78 feet)	840
Total Cost of Wire Line workover	$1890

Average cost for a conventional-type workover of this same well would have been $4390 according to past experience.

In Mississippi, a wire line workover was performed on a 10,500-foot well. Total cost was only $2100 and the time required was only four days. Estimated cost for a conventional workover on this same well was a minimum of $5000.

In special cases, there are particular advantages, as demonstrated by a recent workover on a well located on an island in the Mississippi River near Natchez. All equipment had to be barged to the location, requiring an 8-hour round trip by water. The well was 6800 feet deep and existing perforations were squeezed and perforated at a higher interval. Total time consumed was only three days, and total cost of the wire line workover was just $2500. Field personnel estimated that it would have cost about $6300 if the well had been worked over by conventional methods using a rig located elsewhere on the island. To barge one in for this job would have made the cost of a conventional workover even higher.

These examples are but a few of the hundreds of highly successful jobs. Other examples outlined earlier exemplify the higher order of savings affected by wire line workovers. It is anticipated that as the method grows in field application, and equipment and procedures are further developed, even these savings can be increased.

Future is unlimited and deserves watching . . .

It Doesn't take much imagination after reviewing what has been presented here to realize how much work has gone on before. Tools, equipment and techniques had to be tested in the shop and in the field. New ideas are introduced constantly, and better ways to do the job are being formed. By the time this compilation is printed, other significant developments in the field of permanent completions will make their appearance. The future for this new concept of completion practices is almost unlimited, and deserves close observation.

BIBLIOGRAPHY

"Well Completion Practices" by T. A. Huber, T. O. Allen and G. F. Abendroth, Humble Oil & Refining Co., API Annual Meet, Los Angeles, Nov. 14, 1950.

"A Modified Low-Strength Cement" by B. E. Morgan and G. K. Dumbauld, Humble Oil & Refining Co., AIME Fall Meeting, New Orleans, Oct. 4-6, 1950.

"A Method of Perforating Casing Below Tubing" by M. P. Lebourg and G. R. Hodgson, Schlumberger Well Surveying Corp., AIME Fall Meeting, Houston, Oct. 1-3, 1952.

"Permanent-Type Well Completion" by T. A. Huber, and G. H. Tausch, Humble Oil & Refining Co., AIME Fall Meeting, Houston, Oct. 1-3, 1952.

"Completing Wells for Keeps," *Humble Way*, Nov.-Dec. 1952.

"Wire Line Methods Cut Workover Costs" by J. E. Kastrop, World Oil, Aug. 1, 1953.

"New Developments in the Use of Bentonite in Cements" by B. E. Morgan and G. K. Dumbauld, Humble Oil & Refining Co., API Spring Meeting, Fort Worth, Tex., March 4-6, 1953.

"Here's the Equipment You'll Need for that Permanent-Type Well Completion," by Ed McGhee, Oil & Gas Journal, Dec. 7, 1953.

"A Simplified Cementing Technique for Recompletion Operations" by T. A. Huber, G. H. Tausch, and J. R. Dublin, III, Humble Oil & Refining Co., AIME Fall Meeting, Dallas, Oct. 18-21, 1953.

"Wire Line Operations, Tubing Extension, and Associated Equipment" by H. B. Schramm, Otis Engineering Corp., presented at Symposium on Permanent Type Well Completions, Houston, Jan. 12, 1954.

ACKNOWLEDGMENT

The Editors of World Oil wish to acknowledge with thanks the invaluable material and help generously provided by Humble Oil & Refining Co., Houston, through whose cooperation this report would not have been possible; to Otis Engineering Corp., Dallas; Brown Oil Tools, Inc., Houston; Camco, Inc., Houston; Baker Oil Tools, Inc., Los Angeles; Garrett Oil Tools, Inc., Houston; Schlumberger Well Surveying Corp., Houston, and Perforating Guns Atlas Corp., Houston.

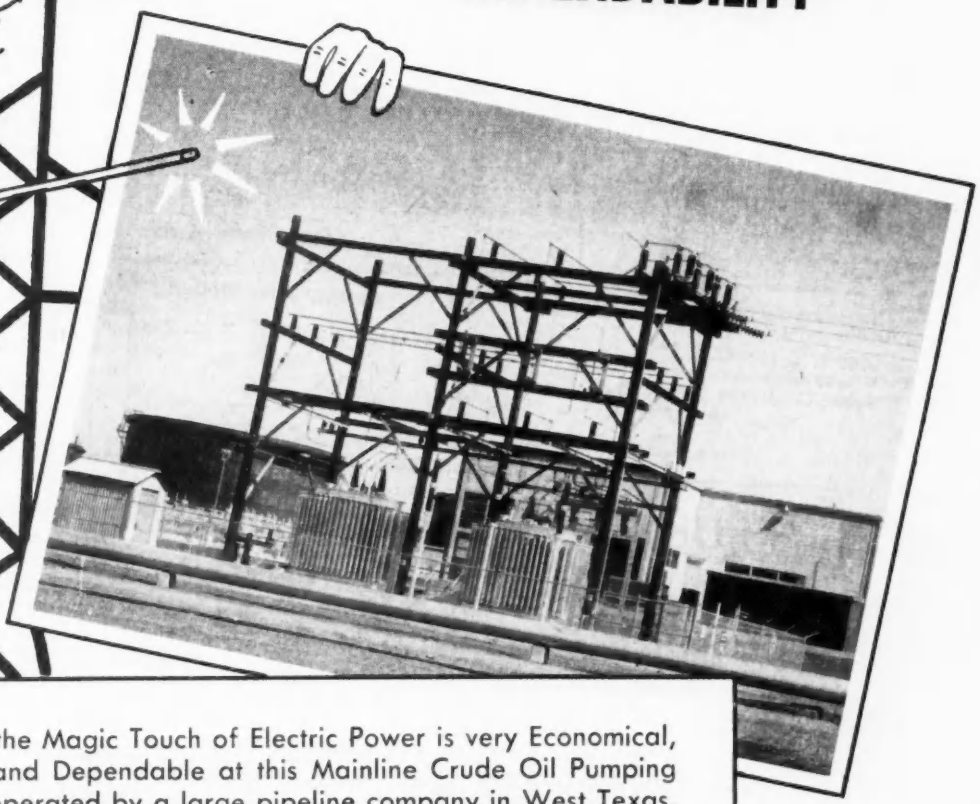
—The End

The Magic Touch of

Electric Power

MEANS

ECONOMY, EFFICIENCY, DEPENDABILITY



Yes, the Magic Touch of Electric Power is very Economical, Efficient and Dependable at this Mainline Crude Oil Pumping Station, operated by a large pipeline company in West Texas. In this station are three 3,000 H.P. and one 1,250 H.P. motors with over eighty Electrically operated valves. You can readily see that Low Cost Purchased Electric Power is doing a real job with its "Magic Touch." For the BEST ALL-AROUND POWER PERFORMANCE . . . SWITCH to Low Cost Purchased Electric Power . . . TODAY! For full details call your nearest Electric Power Company.

Petroleum Electric Power Association

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

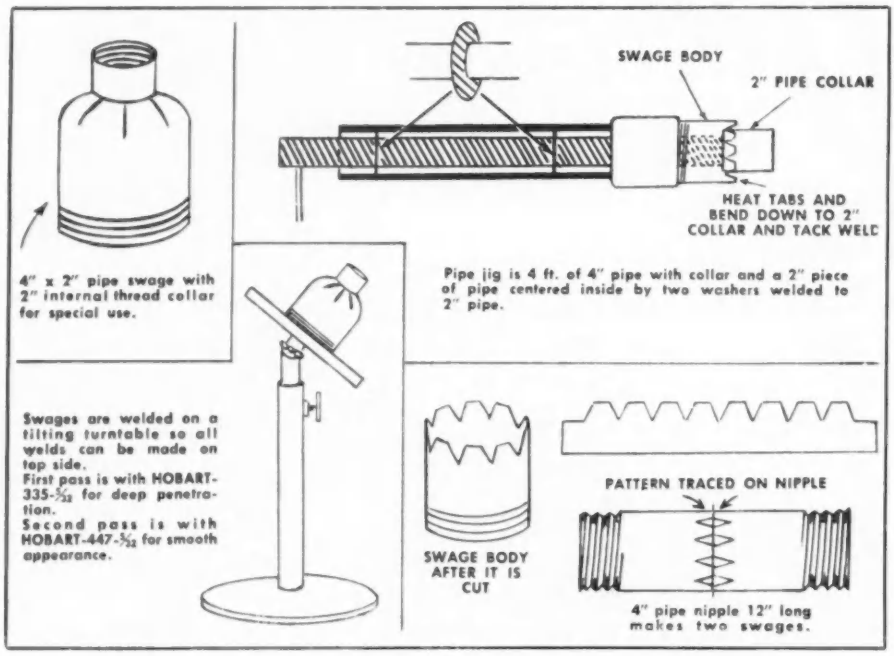
CALL YOUR NEAREST ELECTRIC SERVICE COMPANY FOR MORE FACTS OR ADDRESS YOUR REQUEST TO P. O. BOX 2771, DALLAS, TEXAS

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

How to do it

PRODUCTION HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.


SWAGE BODY
2" PIPE COLLAR
HEAT TABS AND BEND DOWN TO 2" COLLAR AND TACK WELD
4" x 2" pipe swage with 2" internal thread collar for special use.
Pipe jig is 4 ft. of 4" pipe with collar and a 2" piece of pipe centered inside by two washers welded to 2" pipe.
Swages are welded on a tilting turntable so all welds can be made on top side.
First pass is with HOBART-335-5/32 for deep penetration.
Second pass is with HOBART-447-5/32 for smooth appearance.
SWAGE BODY AFTER IT IS CUT
PATTERN TRACED ON NIPPLE
4" pipe nipple 12" long makes two swages.

Jigs Speed Up Pipe Swage Production

When a large number of special swage pipe fittings which had to be fabricated by arc welding in the shop were needed, a jig was devised to speed up production.

This special swage differs from the conventional or standard pipe swage in that the smaller end contains inside threads instead of conventional outside threads. This particular special swage is made from four-inch nipples and two-inch pipe collars. One end of the four-inch nipple is threaded, the other end notched so that it can be "orange peeled" down to fit around the two-inch collar. In making such a swage, the problem is one of centering the collar inside the four-inch nipple.

The jig consists of a four-foot piece of four-inch pipe, to the end of which is attached a four-inch collar. Fitting inside this four-inch pipe is a five-foot section of two-inch pipe, threaded at one end. Two washers are welded to this two-inch pipe so that it is centered inside the four-inch pipe.

A four-inch pipe nipple 12 inches long and threaded at both ends was cut in half to make the body of two swages. Notch it as shown, and screw the threaded end into the collar of the jig. Screw the two-inch collar onto the centered two-inch pipe, heat the tabs of the swage body, bend them down and tack weld them to the collar. Remove the swage from the jig and mount it on a tilting turntable where the finished weld can be made by two passes with the arc welder.

Ditch Fence Completes Battery Enclosure

Fencing-in of sumps situated near inhabited areas or wherever children or animals may venture is becoming an important obligation of operators. While the main sump enclosure usually can be installed without undue difficulty, the ditch leading into or out of the sump often presents a problem in that it is more difficult to enclose in such a way that the barrier can be removed as and when necessary to clean out accumulated flotsam or settlings. One operator solved the problem neatly by fabricating a comblike structure using salvaged sucker rod material, the dozen or so evenly-spaced rods extending down into the ditch vertically and being welded to a horizontal bar spanning the area.

The unit easily is constructed in either of several different ways. If a pattern is made of the ditch profile, the unit can be prefabricated entirely in the shop. If field arc-welding equipment is handy at the site, the cross bar can be installed and each tooth of assembly positioned and welded into place. If only a cutting torch is available at the site, the unit

Call your
BUTLER
distributor—
be sure of.....

OIL-TIGHT

bolted steel tank erection

IN YOUR LOCATION:

UNION TANK AND SUPPLY COMPANY

Fort Worth, Texas	Abilene, Texas	Wichita, Kansas	Denver, Colorado
Houston, Texas	Dallas, Texas	Plainville, Kansas	Sterling, Colorado
Odessa, Texas	LaFayette, Louisiana	Great Bend, Kansas	Casper, Wyoming
Alice, Texas	New Orleans, Louisiana	Tulsa, Oklahoma	Newcastle, Wyoming
Midland, Texas	Dubach, Louisiana	Oklahoma City, Oklahoma	Powell, Wyoming
Nocona, Texas	Glendive, Montana	Hobbs, New Mexico	

AMERICAN PIPE AND SUPPLY COMPANY

Casper, Wyoming — Denver, Colorado — Cut Bank, Montana

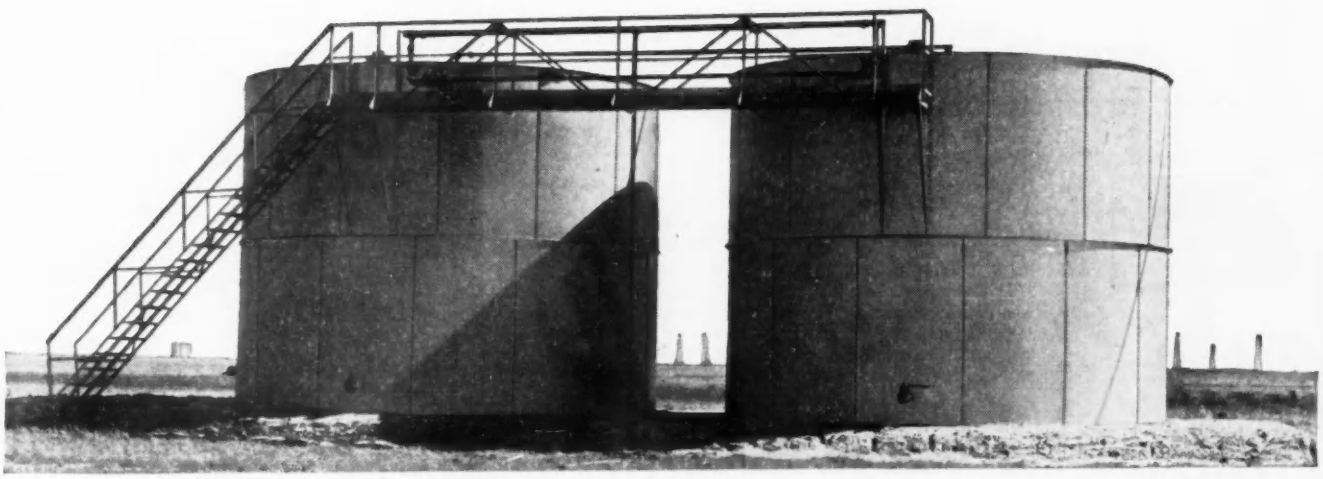
HARRY G. MILLER
El Dorado, Arkansas

Trained crews with years of oil field experience quickly erect the precision-made sheets of Butler bolted steel oil tanks. Every bolt is tightened just right, pulling the sheets against the accurately prepunched rubber gaskets. As a result, every joint is made positively oil tight.

And, as a result, Butler bolted tanks require little attention, stay good looking for years.

Be sure of getting oil-tight bolted tanks—erected when you need them. Call your nearby Butler distributor.

Butler stairways and walkways are easy to assemble and will give years of servce. They fit all A.P.I. bolted tanks and may be used in many other ways.



BUTLER STEEL PRODUCTS

BUTLER MANUFACTURING COMPANY
7466 East 13th Street, Kansas City 26, Missouri

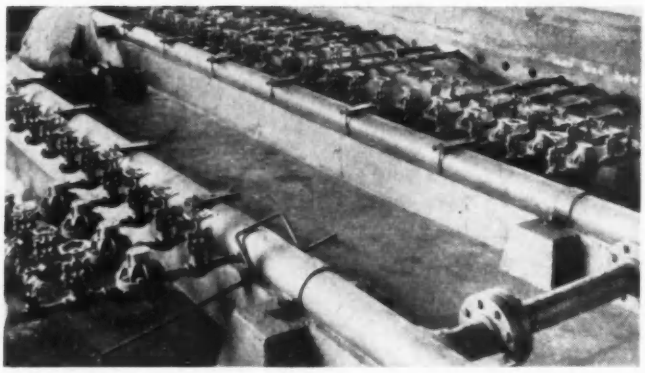
Manufacturers of Oil Equipment · Steel Buildings · Farm Equipment · Cleaners Equipment · Special Products
Factories located at Kansas City, Mo. · Galesburg, Ill. · Richmond, Calif. · Birmingham, Ala. · Minneapolis, Minn

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

may be made up in the shop using rods known to be slightly longer than necessary. After setting it in the ditch, the individual teeth can be burned off as the profile may require.

The unit is held in place by dropping the two short end rods through rings welded to posts or extensions of posts on either side of the ditch. It is easily taken up and replaced as desired.

Centralize Water Injection Controls



One wing on the building which houses water flood injection pumps and motors contains the injection manifold shown here for convenience, protection of meters, and simplification of connections. Two parallel 10-inch headers carry the injection water from two banks of triplex pumps. Both banks of pumps operate at about the same discharge pressure, and the manifolds are tied together at two points as indicated. Reason for the tie-in is that one manifold line may be carrying most of the load, as shown. In order to prevent overloading one bank of injection pumps, while the other idles along, the load can be distributed by the tie-in lines.

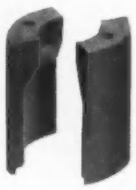
By centralizing the injection controls at one point, the plant operator can easily supervise the injection program. Since it is desirable to measure the volume of water injected into each well, positive displacement meters are installed in each flow line leading to an injection well. This line is equipped with valves for regulating the back pressure desired as well as volume. Undercover construction protects the meters from weather damage, and permits continued attention in winter. There are no turns of bends in the 10-inch discharge lines that extend the full length of the injection pump battery. All pumps discharge into this header, to minimize friction losses in the system. The line is anchored in position by channel iron held down by bolts grouted in the concrete sill supporting the headers.

Micra-switch Safeguards Waterflood Injection Pump

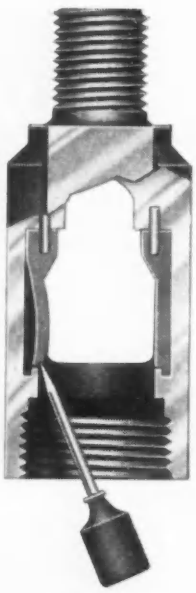
A micro-switch mounted on a bracket so that the stem of the discharge valve made contact with the switch served as a watchdog for this motor-driven injection pump. If by

RUBBER GUIDE CAGES

John N. Martin Patent No. 2,591,174



OPEN TYPE TOP CAGE



Guides are Easily Replaceable

Resilient Synthetic Ball Guides do not beat out– Outwear Metals– Protect the Ball in Several Ways–Reduce Ball and Seat Failures– Reduce Pulling Jobs– Available in all sizes and styles, Open or Closed Types, 1″ to 4¾″.

Complete information in our 1953 Catalog

Sold thru supply companies

FIELD REPRESENTATIVES (Manufacturers Agents):

H. G. Crider, Ardmore, Okla., Phone 2941
J. L. Davis, Houston, Tex., Phone MO-4891
Tom (W. D.) Hulett, El Dorado, Ark., Phone 3-4545
John B. Leland, Wheatridge, Colo., Phone Arvada 489R
Red (L. K.) Martin, Corpus Christi, Tex., Phone 2-5317
Ellis Garlington, Jr., Tulsa, Okla.

JOHN N. MARTIN

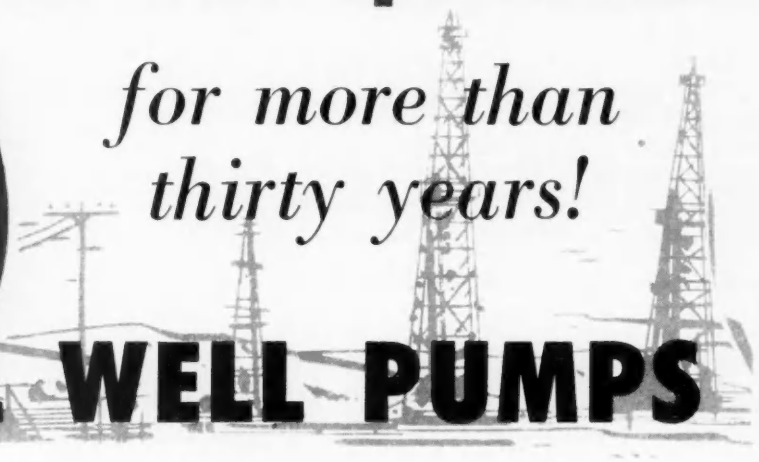
MANUFACTURER

9 W. Brady St., Tulsa, Okla. **Tel. 4-9415**

Winning the good will of oil well operators

Sargent

for more than thirty years!



OIL WELL PUMPS

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.

—U. S. SUPREME COURT

"Getting the job done" means lifting *more* oil at *lower cost* in any oil field. For more than thirty years, operators have found that Sargent Pumps get the job done efficiently and with a lot less trouble.

Now through Sargent Field Stores, deep well pumps and other production equipment are sold and serviced by men who know local field conditions and are interested in helping operators "get the job done" efficiently and economically.

Whatever your production equipment problems are, talk them over with the Field Representative at your nearest Sargent Field Store.

SALES & SERVICE FIELD STORES

CALIFORNIA
Long Beach
Bakersfield
Santa Maria
Ventura
Taft
Huntington Park

OKLAHOMA
Oklahoma City
Pawhuska
Seminole
Tulsa

TEXAS
Odessa
Snyder
Houston
Sundown
Wichita Falls
Quitman

NEW MEXICO
Hobbs

KANSAS
Chase

ILLINOIS
Grayville

ARKANSAS
Magnolia

COLORADO
Rangely

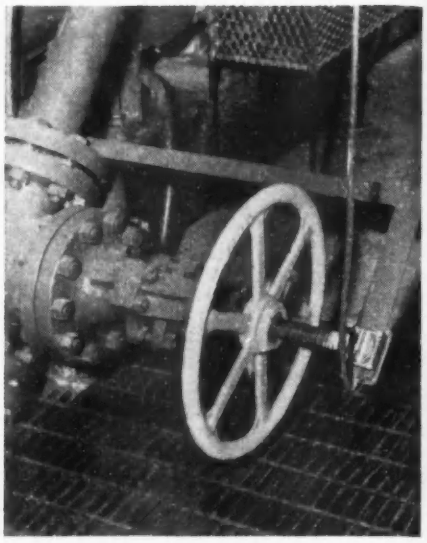
Sargent **ENGINEERING CORPORATION**

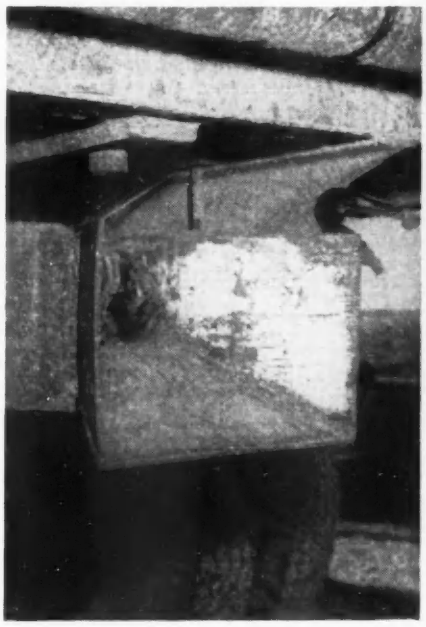
MAIN OFFICE AND PLANT
2533 EAST FIFTY SIXTH STREET
HUNTINGTON PARK, CALIFORNIA, U.S.A.

accident, the discharge valve was not opened, the heavy load on the pump would be transferred to the electric motor driving it, and a failure might occur either in the pump or in the electric motor.

To guard against such a possibility, this device was installed. It consists of a 1½-inch by 1½-inch angle iron bracket made in the form of a long ell. One end of the bracket was drilled and anchored in one of the flange bolts as indicated. A micro-switch was mounted on the other end of the bracket which was long enough so that the end of the valve stem made contact with the switch when the valve was wide open.

Electric wires from the switch were hung from the overhead joists so that they were out of the way. This control wire terminated at the control box for that particular pump and motor. Unless the valve stem was in contact with the micro-switch, the motor would not operate. The valve handle and the tip of the valve stem were painted yellow as a reminder to the station operator of the status of the discharge line. A lot of protection was provided at a reasonable cost.





Funnel Device Guides Trailer Connection

Quick connections between truck and trailer were made by adding this simple little funnel device to the truck frame. It is merely a funnel made of 3/16-inch steel plate, open on the top side and welded to the truck frame so that it surrounds the trailer hook. Anyone experienced with hooking up a heavy trailer to a truck or car trailer connection knows the effort sometimes required to make the two parts interlock.

With this funnel device around the

JENSEN meets the challenge —and WINS!

We have said many times that any well is likely to be more profitable, more dependable and more satisfactory in every way when equipped with a JENSEN Pumping Unit.

This claim has been challenged by producers all over the world who have been using other types of pumping equipment . . . and we are proud to say that JENSENS have lived up to their good name in competition everywhere.

We invite you to challenge this statement. Ask people who own JENSEN Units . . . talk to your nearest JENSEN Dealer . . . or write us at Coffeyville.

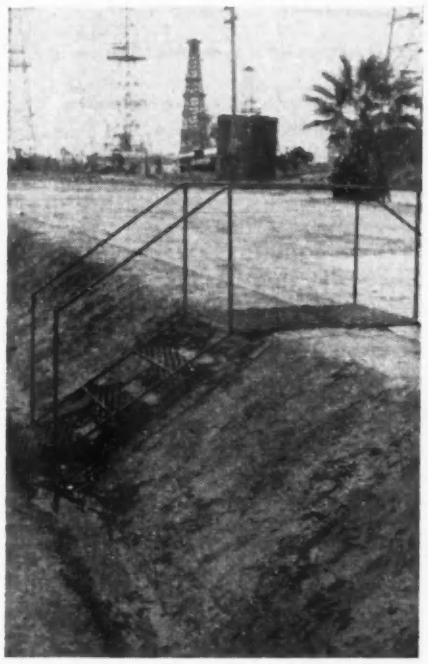
JENSEN

BROS. MFG. CO., INC.

Coffeyville, Kansas, U.S.A.

EXPORT OFFICE: 50 CHURCH STREET, NEW YORK CITY

trailer hook on the truck, it is only necessary that the eye on the trailer tongue land in the mouth of the funnel which will guide it in place. This idea has been particularly useful in equipping trucks or pickups that must be called into service to pull fire fighting equipment in case of fires around leases or production camps. Time is valuable in an emergency, and such a device makes it easy to hook up a trailer to the truck.



Firewall Walkway Is Easily Constructed

An inexpensive firewall stairway, of a simple design that lends itself to easy construction by the welder from scrap sucker rod and expanded metal materials, is shown in the accompanying photograph. Ordinarily, firewalls surrounding tank batteries of any one company will be sufficiently alike that from a given pattern, a number of such stairways can be made up in the shop at once. Transported to the field as a complete unit, a stairway can be set up without resorting to expensive field carpenter labor. Being of all-steel construction, it will not deteriorate or break down as is frequently the case with commonly-used wooden stairways.

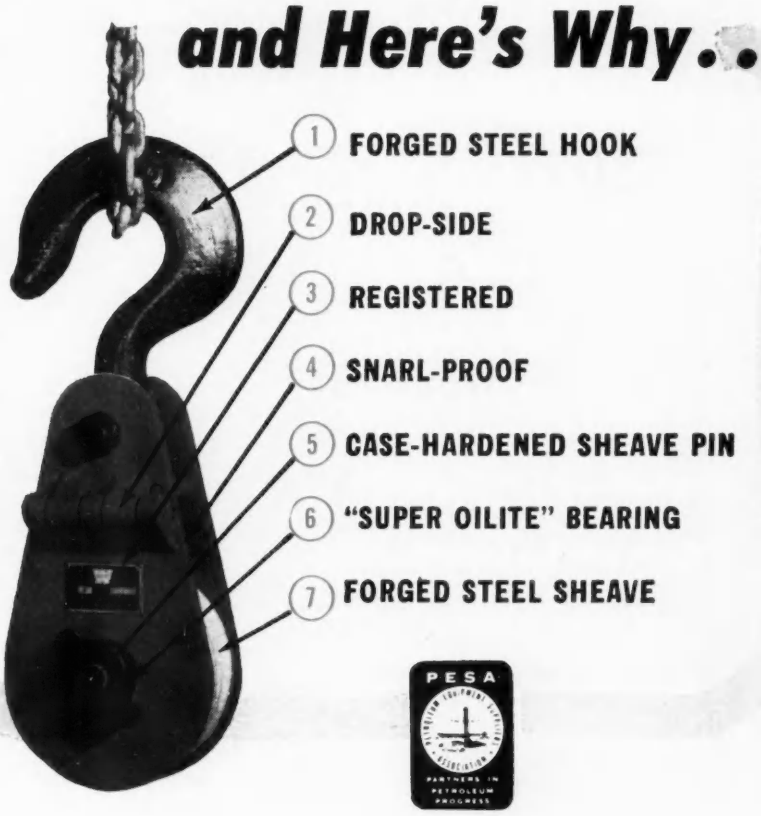
Such a unit easily repays its cost in reduced maintenance and repair

WECO

DROP-SIDE SNATCH BLOCKS

Patented

Your Best Buy and Here's Why..



PESA

PARTNERS IN PETROLEUM PROGRESS

These 7 great features assure superior service and performance. WECO Drop-Side Snatch Blocks are easy to handle . . . safer to use . . . have greater strength, safety and utility.

Sides are 3/8" steel plate. Hook or clevis is full swiveling. Wire line or manila rope cannot slip between sheave and side plates.

The patented WECO Drop-Side makes it easy to string or unstring the snatch block at any time. You just remove the wing-nut, raise the side, insert the line, drop the side and replace the wing-nut. Blocks are available in 6", 8" and 10" sizes.

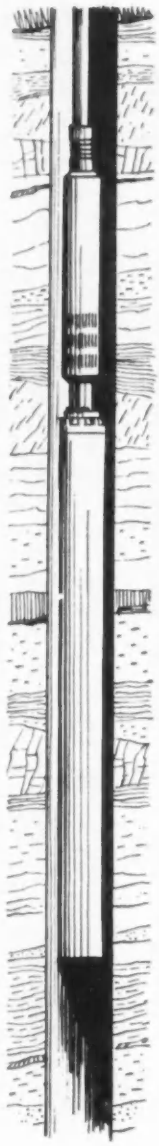
Ask your Supply Store or industrial distributor for WECO Drop-Side Snatch Blocks.

It's Wise to Standardize with... WECO ...

WELL EQUIPMENT MFG. CORP.
Division of Chiksan Company
HOUSTON 1, TEXAS
CHIKSAN COMPANY
Brea, Calif. Chicago 28, Ill. Newark 2, N. J.
CHIKSAN EXPORT COMPANY, Brea, Calif. Newark 2, N. J.

Manufacturers and Distributors of Oilfield, Refining, Marine and Industrial Equipment

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)



THE BEST WAY TO *LOWER* OPERATING COSTS.... *LOWER* A **REDA** PUMP INTO YOUR WELL

With continually rising labor and investment costs, economy of operation is of paramount importance in producing wells with decreasing oil-water ratios.

Reda pumps are given consideration as original or replacement equipment because of their known performance in producing fluid at a *lower* cost per barrel, thus often extending the ultimate economic life of wells.

Improved engineering and design have increased operating life. Increased operating life means *lower* labor cost per barrel, *lower* investment cost per barrel, *lower* maintenance cost per barrel: *lower cost per barrel produced.*

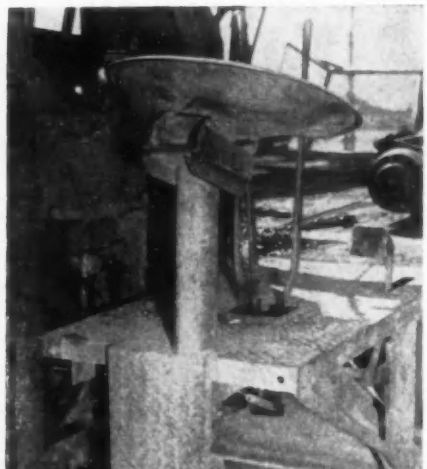
REDA

PUMP COMPANY

BARTLESVILLE, OKLAHOMA

HINTS . . .

of firewalls. Should the tank battery be moved or abandoned, the stairway unit, 100 percent salvageable, easily is taken up and re-installed elsewhere.



Hinged Seat Occupies Little Space on Crane

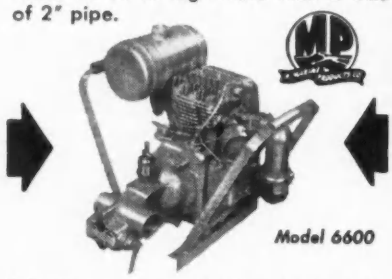
When maximum bed space is needed on a truck-mounted crane used for general leasework, it is convenient to be able to remove the crane operator's seat or at least tilt it to one side so it occupies a minimum of space.

One company built the shop-made seat illustrated in the photograph which permits tilting the seat unit to one side. A common tractor-type seat, a type which combines sturdiness with maximum comfort, was welded to the web side of a short piece of channel iron. A similar length of the same size channel material was welded, web side down, to a short pipe post welded to the steel decking of the truck bed.

Ability to tilt the seat was made possible by welding to the inboard side of the two matching channel sections, a length of piano-type hinge, the latter made of small diameter pipe through which is run a hinge pin of steel rod. The sturdy seat can be tilted and rotated through more than 90 degrees. Because of the large area provided by the back-to-back channel sections, the seat is unusually stable with the heaviest of operators.

A MILE OF OIL!

This compact little pump delivers a barrel of oil per minute at 150 pounds pressure—enough pressure to pump water or oil through more than a mile of 2" pipe.



Model 6600

- Erosion resistant synthethic rotors for dirty liquids.
- Corrosion resistant bronze construction.
- Lightweight • Portable • Self Priming.
- Available for Gas Engine, Electric or Belt Drive.

Proven Superiority in

BRAKE COOLING
WASH-DOWN
TRANSFER
FIRE FIGHTING
WASTE DISPOSAL

And numerous other specialized oil field pumping jobs.

AVAILABLE AT LEADING OIL FIELD STORES

MARINE PRODUCTS COMPANY
515 LYCASTE AVE., DETROIT 14, MICHIGAN

For **POWER PISTON RINGS** HIGHLY DURABLE

FRANCE

To endure in critical operating conditions, Power Piston Rings must be engineered, produced to withstand constant pressure and develop greater power.

The Centrifugal Casting and "Heat Tensioning" methods used by France have proved: here are Piston Rings that assure you longer life and efficient oil control with no warping or loss of tension in service.

SPECIFY FRANCE POWER PISTON RINGS

Write for Complete Information

MAXIMUM SERVICE for you in our NEW PLANT

FRANCE PACKING COMPANY

9925 Bustleton Ave., Philadelphia 15, Pa.

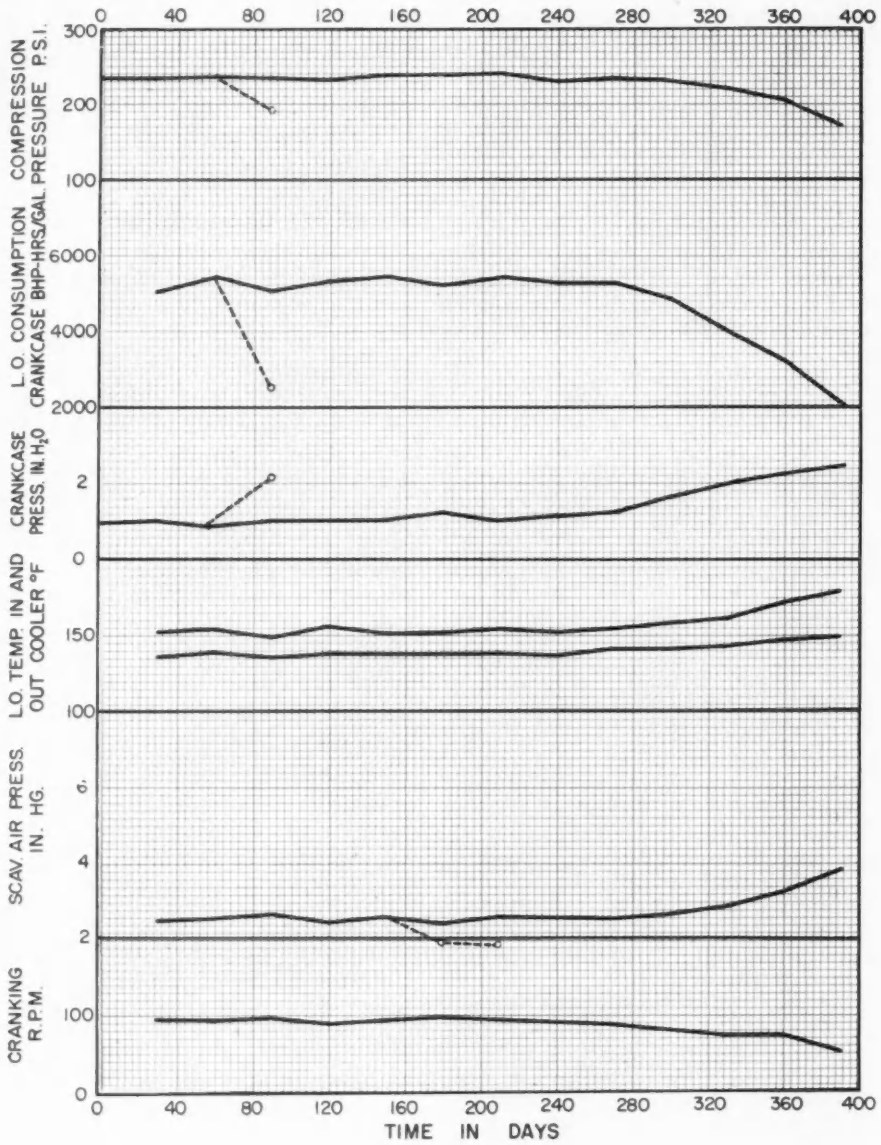

0 40 80 120 160 200 240 280 320 360 400
CRANKING R.P.M.
SCAV. AIR PRESS. IN. HG.
LO. TEMP IN AND OUT COOLER °F
CRANKCASE PRESS. IN. H_2O
L.O. CONSUMPTION CRANKCASE BHP-HRS/GAL.
COMPRESSION PRESSURE P.S.I.
TIME IN DAYS

FIGURE 1

How to Detect and Test For Gas Engine Blow-by

A few simple tests will give warning of engine trouble ahead.

By JAMES H. CALDWELL, Service Engineer,
The Cooper-Bessemer Corporation, Mount Vernon, Ohio

ONE OF THE MOST disastrous and detrimental things that can happen to an engine is blow-by. When operated under this condition an engine is uneconomical not only because it increases lube oil and fuel consumption, but if it is allowed to operate for a lengthy period, compression pressure is naturally decreased. This is accompanied by an increase in temperatures resulting in eventual ring, piston, valve, head, liner and supercharger failures.

The Causes. Many things such as abrasion, corrosion, and scuffing of piston rings or liners cause blow-by. However, this article will be limited to watching for and detecting this condition.

Look for Loss of Compression. A loss of compression pressure is one of the best indicators of blow-by. Since it is so important, let us first deal with the conditions under which compression pressures should be taken. To the engine builder, the exact value of compression pressure is very important; but to some operators it has little significance. A change in compression pressure should be watched for constantly. Compression pressure can be taken under the most convenient conditions; for the two cycle natural gas engine, which does not have variable scavenging air pressure with load, taking this reading at idling speed is satisfactory. However, for the two and four-cycle engines with air butterfly valves, which reduce scavenging air as the load decreases, the compression pressure will have to be recorded under load. When on load the air butterfly valve is open but, under idling conditions the compression pressure is reduced greatly by the nearly closed valve. Therefore, for these engines choose about three-fourths load and cut out the cylinder to record the compression pressure.

Take the reading under the same conditions each time. When an engine is new or in good operating condition, the compression pressure should be recorded, at regular intervals. If these readings are taken under identical conditions month after month; and if the piston rings are seating properly, the values will remain practically the same except probably for a small deviation due to changes in atmospheric conditions. When the values drop off, a re-ring job soon will be necessary. Often the engine cannot be taken off the line immediately to do this job; however, the drop-off in pressure will be gradual toward the approach of an overhaul, and the operator will be able to plan accordingly. He may have as much as two months warning before the engine is in dangerous condition.

In the compression pressure curve in Figure 1, note that it was made up

from an average of the values of all cylinder readings. In the case of the premature failure as noted by the dotted line, one cylinder in bad condition might not bring the average down low enough to make an appreciable drop in the curve. Instead of making a curve for each cylinder and then increasing the amount of paper work, it might be well to add a note, near the dot for each particular month, that this one particular cylinder was lower than the others. During the succeeding months if the compression pressure in that particular cylinder decreases to a dangerous figure, then the notation will be the red light that tells the operator a disassembly is necessary for inspection.

It will be noted from Figure 1 that the lubricating oil consumption curve is figured in brake horsepower hours per gallon. Regardless of the load conditions under which the engine has been operating, this is figured on rated horsepower of the engine; that is, the rated horsepower of the engine is multiplied by the number of operating hours and that figure divided by the gallons used, to get the figure of horsepower hours per gallon. This yardstick is a very good one for installations where the load is steady and in the vicinity of rated horsepower.

Check Valves, Too. In the case of four-cycle engines a drop in compression pressure might also be caused by bad valves. A good way to differentiate between the two causes of drop in compression pressure is to remove a crankcase door and run the engine on starting air. If a hissing sound is noticed in the crankcase, the operator can be assured that the cause of the blow-by is malfunctioning of the rings. If this hissing sound is not heard and if a popping sound is noticed in the exhaust or intake manifolds, it is quite evident that the compression pressure drop is caused by valves.

Some operators are blessed with the faculty of being able to determine whether or not the valves are functioning properly by simply watching their action. That is, they can remove the covers and by noting any strange action of the springs can be assured that the cause of compression pressure drop is malfunctioning valves. It might be advisable for more operators to spend time watching the action of the valves when they are in good condition.

Fig. 2—Special tool to remove carbon from piston ring grooves.

Fig. 3—Hone used to remove cylinder glaze.

Check Scavenging Valves. In regard to the two-cycle engines, a drop in compression pressure could be caused by improper operation of the scavenging valves or clogged intake cleaners. One can check their condition by taking scavenging air pressure readings and if this value has dropped the operator will know that either the air filter is clogged or the scavenging valves need attention. Summarizing the above, the operator can put his finger on the cause of decrease in compression pressure without dismantling the engine.

Watch for Consumption Increase. Lubricating oil consumption is an excellent means of determining blow-by and a very good indicator of compression and oil ring condition. As long as the compression rings are sealing properly the hot combustion gases will not wash lubricating oil from the cylinder walls. It is also true that the compression rings play as great a part in the control of lubricating oil consumption as the oil rings. Any malfunctioning on their part will be reflected immediately in increased lube oil consumption. The general purpose of oil control rings used in unported cylinders is often misunderstood. They do more than scrape oil from the cylinder walls. Their main purpose is to meter an exact amount of oil to the compression rings for their lubrication. It can be seen that if they meter too much oil, as they begin to wear or lose tension, an excessive amount of oil will be burned. The result will be carbon formation and stuck rings.

Consequently, if the engine is allowed to operate while using an excessive amount of lubricating oil, the rings are not properly lubricated and scuffing will start. This will cause ring and liner wear accompanied by increased maintenance cost. The gradual drop-off of the lube oil consumption curve shown in Figure 1 indicates that the engine will soon require an overhaul.

Leave Rings on Piston. When an increase in lubricating oil consumption is noted, many operators take the pistons from the cylinders and remove the rings from the pistons in order to clean the grooves. This is considered a very bad practice because once the ring is expanded sufficiently to be removed from the piston, it is distorted to such an extent that it will never seat in the cylinder again. In a majority of cases where this is practiced, more lubricating oil is consumed after the overhaul than before. Therefore, if the pistons are removed from the cylinders it is advisable to leave the rings on the piston. Of

course, carbon must be removed from the grooves and a special tool can be made to fit in the ring groove at the piston ring gap for this purpose. This tool can then be drawn around the cylinder along with the ring until the groove is cleaned. Figure 2 is an illustration of such a tool.

It is generally known that combustion gases are sealed by a good fit in the bottom of the ring groove as well as between the face of the ring and the cylinder wall. In cleaning the piston ring grooves, one should be careful to remove all carbon from that seating surface without nicking or burring it.

It is true that the top two rings do most of the work; and as a result lose their life much sooner. Knowing this, it is the practice of some operators while overhauling an engine to remove and replace the top two rings only. It should be remembered that engine overhauls are very costly and it is more economical in the long run to replace all compression rings.

Check Scraping Edge of Rings. The scraping edge of oil rings is usually very sharp and as the ring loses its efficiency the land on the scraping edge becomes wider. It is a common error of operators to overlook the excessive wear on this scraping edge. In many cases the oil rings are put back in service with the thought that they are in good condition. Before putting an oil ring back into a cylinder, inspect the scraping edge very closely for the wide land, nicks or burrs that have been put on the ring during assembly or previous handling.

It should be remembered that regardless of the condition of the oil ring it will not scrape oil from the walls efficiently if proper drainage is not provided. To make certain of proper drainage, the drain holes in the piston should be checked thoroughly for sludge or carbon.

Remove Cylinder Glaze Before Installing Rings. After a piston has operated in a cylinder for a number of hours, a very hard surface appears on the cylinder wall. This is known as cylinder glaze. If new rings are installed or the same ones put back in, the rings have to seat into this hard glaze. As a rule this interferes with proper seating and blow-by will be so excessive, washing lubrication off to such an extent that proper seating of the rings to the cylinder cannot be realized. In order to remove this cylinder glaze before installing new rings, many operators use a hone, driven by a small electric or air motor. This hone can be equipped with very fine finishing stones which do not remove much metal but will remove cylinder glaze.

It would be advisable to investigate the purchase of such a hone. In cases where the cylinder bore is oversized, it is advisable to remove this glaze with fine emery cloth. The cloth can be placed in the palm of the hand and spiral strokes can be used effectively to roughen the cylinder. Figure 3 is an illustration of a hone that has been used in cylinders as large as 15½ inches in diameter.

Measure Out-of-Roundness and Wear. Of course, the out-of-roundness and wear should be measured in a cylinder before piston installation. Everyone understands that the top part of the liner wears the most because this is where the lubrication is the most critical. The amount of wear depends upon how long the engine has been operated under blow-by conditions. One condition generally misunderstood is that the liners seem to be worn more on the diameter 90° from the thrust side, the fore and aft part of the liner. One would naturally think that most of the wear would take place athwartship. This peculiar condition is usually caused, however, by dirty intake air or improper maintenance of the air filters. The clearance on the thrust side is less than elsewhere; therefore, dirt works around to the fore and aft part of the liner and wears in that vicinity by abrasion.

Test Crankcase Pressure. Crankcase pressure is another means of checking for blow-by. Any change in crankcase pressure is caused by excessive amounts of combustion gases getting past the rings and into the crankcase. To test this condition a ⅛-inch pipe tap can be cut into the crankcase at any convenient spot; one of the crankcase doors is the most logical place for it. A short nipple with a valve on the end can be screwed into this tapped hole. A water-filled manometer can be attached to this connection, but it should not be left on the engine because it is broken easily. It also becomes dirty due to crankcase oil vapors. In the case of several engines in one plant it is more economical to use a single manometer.

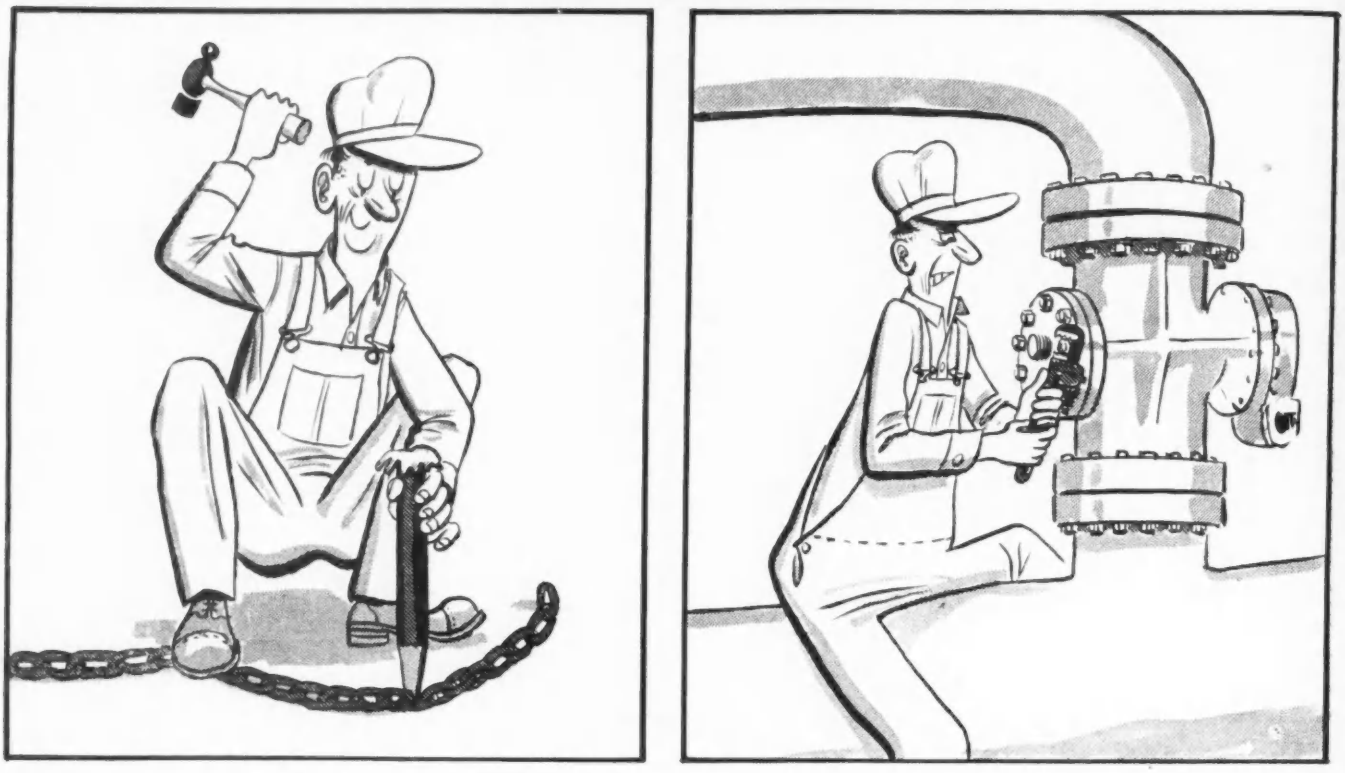
It can be seen from the curve in Figure 1 that as blow-by commences, the crankcase pressure steadily rises at the same period where there was a noticeable change in the compression pressure and lubricating oil consumption curves. As mentioned previously, this test should be taken each time under the same conditions. In this case full load, at full speed would be the condition under which it should be taken.

The amount of vapor coming from the crankcase breather is another excellent means of detecting blow-by. Each day the operator should observe this condition under the same load. As the engine approaches the need of overhaul the amount of vapor will be very evident. In fact, when it reaches that stage the pressure in the crankcase will be so great that vapors will even come out around the crankshaft seal. —**The End**

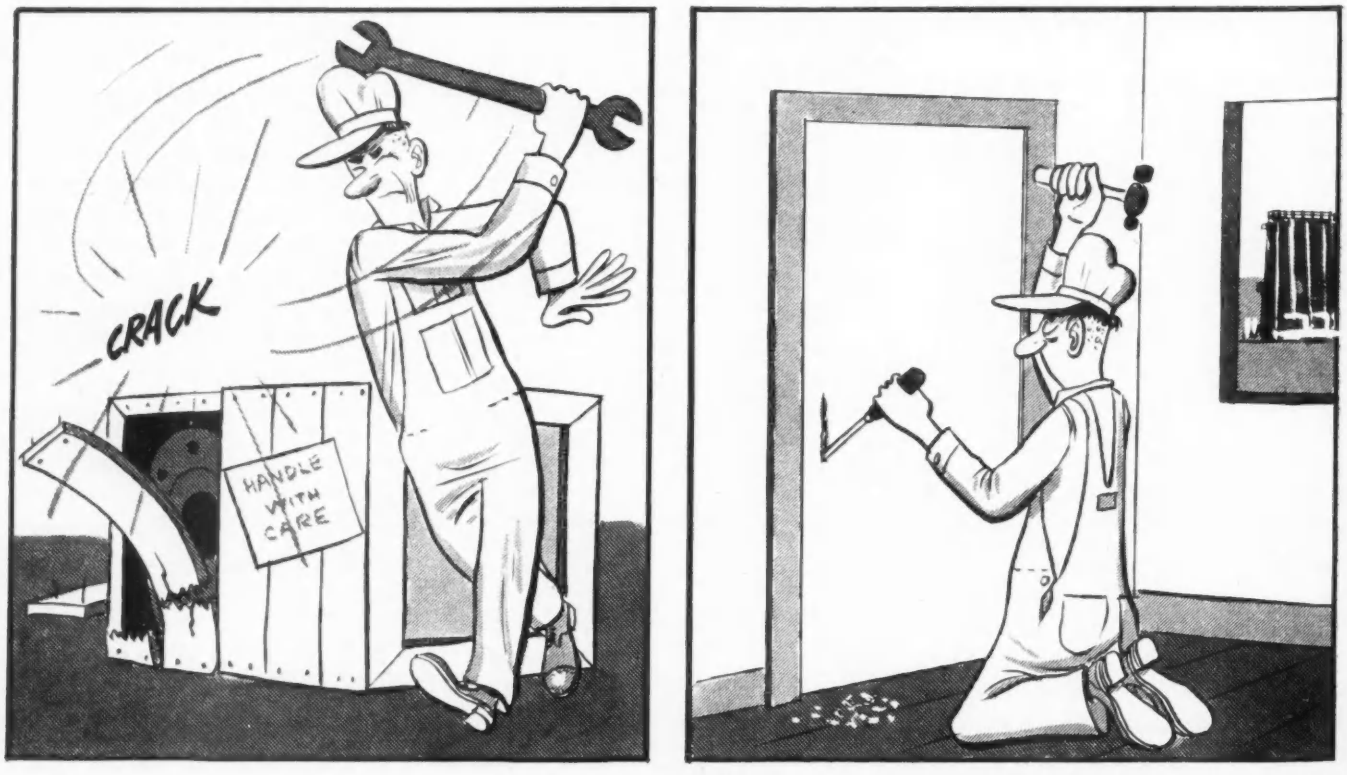
About the Author

JAMES H. CALDWELL was graduated from Ohio State University in 1936 with a degree in mechanical engineering. He started work for Cooper-Bessemer Corporation the same year. After several years of production testing and experimental research work, he was employed at the Bureau of Ships in the Design Section of the Diesel Engine Division at Washington, D. C. In 1945 he returned to Cooper-Bessemer at Mount Vernon, Ohio, where he has since been employed in the Service Department. His present title is assistant to the service manager.

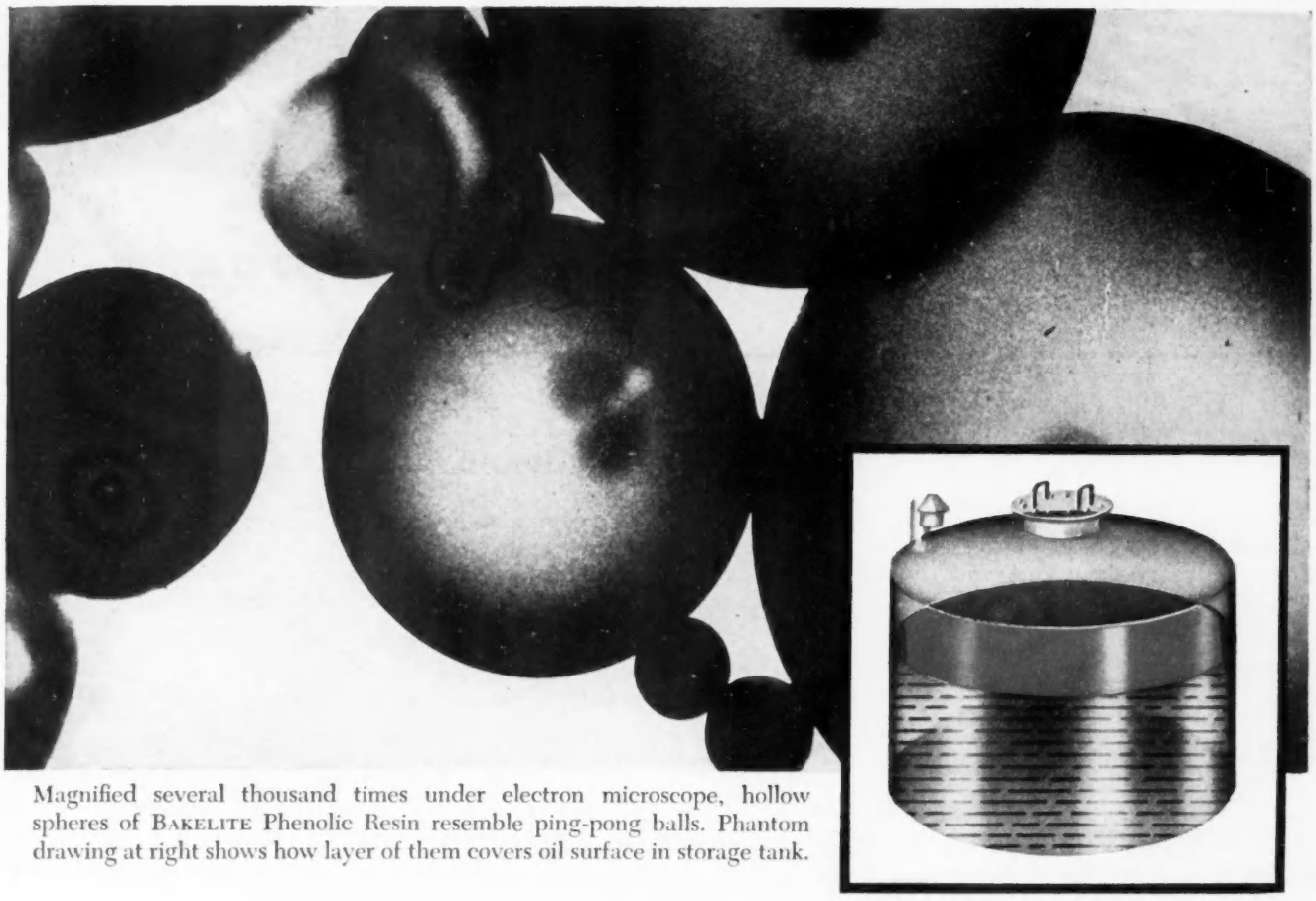
Perils of Pipeline Pete



Watch that chisel! . . . careful with that wrench . . .



With Pete . . . any old tool will do in a pinch!



Magnified several thousand times under electron microscope, hollow spheres of BAKELITE Phenolic Resin resemble ping-pong balls. Phantom drawing at right shows how layer of them covers oil surface in storage tank.

What can MICROBALLOON* spheres do for your Evaporation Problems?

What are they? Illustrated are tiny, hollow spheres of BAKELITE Phenolic Resin filled with inert nitrogen gas. Their diameters average only .0002 to .0036 of an inch. A cubic foot weighs about 8.7 pounds. They have the appearance of finely ground, reddish-brown flour.

What can they do? An inch-thick layer of these spheres, floating on the surface of crude oil in storage tanks, can cut evaporation losses *80 to 90 per cent.* With an 88-foot-diameter tank, this means 2.34 barrels saved every day—over 850 barrels a year.

How are they used? Mixed with crude oil, then pumped into a tank, they float to the surface, forming a blanket that rises and falls with the oil level. This covering flows around internal tank supports, keeping the surface sealed as the level changes. Because BAKELITE Phenolic Resin resists oil, the spheres do not fill and sink. For more than two years, these spheres have floated on crude oil in testing laboratories without measurable deterioration. Their wall strength and resistance to abrasion keep them from bursting as they jostle together and against tank sides. Their small size and non-abrading qualities prevent damage to precision pumps and pipe lines.

Get them from Bakelite Company. For information about these hollow spheres of BAKELITE Phenolic Resins, write Dept. TC-78.

*MICROBALLOON is a trade-mark of the Standard Oil Company (Ohio).

BAKELITE
TRADE-MARK
PHENOLIC RESINS

TRADE MARK
BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company
Division of Union Carbide Canada Limited
Belleville, Ontario

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebook yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Consult the index on page 243 of November WORLD OIL to find the complete classified list of all Rules of Thumb published thus far in the series. Send your Rule of Thumb to Donald M. Taylor, Pipe Line Editor, WORLD OIL, P. O. Box 2608, Houston 1.

Engineering Design —13—How to estimate energy costs for different pipe line throughputs.

The rule of thumb given below will apply to liquid pipe lines where the flow is in the turbulent region only. It will serve to estimate energy requirements for pumping through pipe lines between increments of plus 15 percent and decrements of minus 15 percent.

Rule: Multiply the normal throughput in barrels times the cost of energy per barrel. Then multiply the increment or decrement (provided it is within a range of plus 15 percent or minus 15 percent) times the cost of energy per barrel at normal throughput times 3. Then add or subtract the latter amount from the cost of normal throughput.

Or restated in simpler form:

Cost of energy per barrel at normal throughput = Y

Cost of energy per barrel of increment or decrement within a range of ± 15 percent = 3Y

Example: Assume energy requirements for pumping 2000 barrels per hour through a 12-inch pipe line are $.01 per barrel. What are energy requirements for pumping 2200 barrels per hour?

Energy Cost for 2000 B/H: 2000 × .01 = $20 per hour

Energy Cost for Additional 200 B/H:

200 × .01 (3) = 6 per hour

Energy Cost for 2200 B/H = $26 per hour

Miscellaneous —11—How to estimate the cost of a pipe line in the Mid-Continent Area.

Rule: Multiply the nominal diameter of the pipe times $2400 to get the cost per mile. This figure includes all costs for construction, freight, materials, miscellaneous fittings, right-of-way easements and damages, engineering and inspection, etc.....

Example: Find the cost of a 30-mile-long six-inch pipe line in the Mid-Continent area:

6 × 2400 × 30 = $432,000 (or $14,400 per mile)

Find the cost per mile for laying a 20-inch pipe line in the same area.

Cost of 20-inch = 20 × 2400 = $48,000 per mile.

These costs were obtained by averaging the book value of the completed. Where there is excessive rock, construction costs will be somewhat higher.

IN SPITE OF HIGH WATER

A CAT* SPREAD KEEPS ROLLING

HIGH WATER on the right-of-way has not bogged down this Bucyrus-Erie dragline powered by a rugged Cat D318 Diesel. Operating from wooden mats, the dragline continues to backfill the trench between Hawkins and Longview, Texas. Work is being done by O. R. Burden Construction Co., Tulsa, Oklahoma.

"Caterpillar equipment," reports R. M. Jones, superintendent on the job, "will last longer with less maintenance than any other equipment I've ever used."

This statement comes from experience. Up the line on this fast-moving spread, three D7s, a D8, a D8800 and a D318 are at work.

Standardization on Cat equipment is normal among pipeline men. It's normal because it's profitable. Money is earned because operators and mechanics need only know one make of machinery. Operators get more production out of it and mechanics spend less time maintaining it. Costs are cut because many parts are interchangeable. Parts inventory can be practically eliminated. And expenses fall with the use of low-cost No. 2 furnace oil. All Cat Engines burn it *without fouling.*

Ask your Caterpillar Dealer for the full, money-saving picture on standardization. Leading manufacturers of excavators, ditchers and compressors can furnish Cat Engines as original equipment. And, when it's time to re-power, it's time to see your Caterpillar Dealer.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

A WORD TO THE WISE— STANDARDIZE!

WHAT'S HAPPENING

IN PIPE LINE CONSTRUCTION

Tennessee Gas Announces Huge Expansion

Another huge expansion program has been announced by the Tennessee Gas Transmission Company including plans to lay approximately 637 miles of pipe line in Louisiana, Mississippi, Tennessee, Ohio and Pennsylvania. Two new compressor stations will be built and five existing stations enlarged.

The expansion includes a new 574-mile 30-inch line to begin at the company's compressor station near Kinder, La., and extending northeast through Louisiana, Mississippi and Tennessee to join the existing system at a compressor station near Portland, Tenn.

Also included are 63 miles of 26-inch pipe line to be laid parallel to sections of the existing system in Ohio and Pennsylvania between the Ohio River and a compressor station near Mercer, Penn.

Work on the project is expected to start about June 1 with completion set for well in advance of the winter heating season.

Texas Gas Asks Approval For $1½ Million Construction

Texas Gas Transmission Corporation has filed an application with the FPC asking approval of plans for a $1,596,000 construction program in Louisiana.

The application seeks authority for constructing 24 miles of 16-inch natural gas transmission pipe line in the South Louisiana gas fields, installation of an additional 2000 horsepower compressor unit at the Bastrop, La., compressor station, and erection of a purchase meter station in South Louisiana.

The line would extend from the existing interconnection of the facilities of Texas Gas and Louisiana Natural Gas in the North Tepetate field, Acadia Parish, to a point of interconnection with existing facilities of Louisiana Natural near the South Roanoke field in Jefferson Davis Parish.

Colorado Operators Plan Gas Line Gathering System

Operators of the Little Beaver and Badger Creek fields in Washington and Adams counties, Colorado, plan to proceed immediately with the design and construction of a gas pipe line gathering system and a compressor station to permit marketing of the gas produced in these fields.

Continental Oil Company was appointed temporary operator. It is anticipated that the gathering system and compression facilities will be in operation by mid-summer, 1954.

Operators planning the project are Col-Tex Oil, Inc., Continental Oil Company, Denver Basin Oil Company, Forest Oil Corporation, Goodall Oil Company, Lion Oil Company, Sinclair Oil and Gas Company, Triangle J Oil Company, and Calstar Petroleum Company.

Expanded California Line Moves Record Gas Flow

Two 5000 horsepower turbine-driven centrifugal compressors pumped a record-breaking 685 million cubic feet of natural gas into Southern California on the opening day in January of the new 73-mile 30-inch loop pipe line extension of the Texas-California line, known as the "Biggest Inch."

The line carries natural gas from the Permian Basin in West Texas and the San Juan Basin in New Mexico and Colorado to the California border. The Southern California Gas Company and the Southern Counties Gas Company are cooperating in the multi-million dollar expansion program to increase the supply of natural gas for Southern California to 705 million cubic feet a day.

The 73 miles of loop pipe line is the latest addition the two Southern California gas companies have made on the 214-mile California section of the pipe line.

Texas Illinois Completes $33 Million Project

Daily transmission capacity of Texas Illinois Natural Gas Pipeline Company, one of two major long distance pipe lines supplying natural gas to Chicago region utilities, was increased by 134 million cubic feet upon completion of facilities costing approximately $33,000,000.

With the building program finished and 11 Texas Illinois compressor stations operating, the combined transmission capacity of the two pipe line systems now totals well over a billion cubic feet of natural gas daily.

Six new compressor stations, five having a capacity of 12,000 horsepower and one of 10,000 horsepower, were placed in service along the 30-inch diameter Texas Illinois line on its 1400-mile route from the Texas Gulf Coast to Joliet, Ill.

In all, 40 new internal combustion main compressor engines, capable of developing 80,000 horsepower for moving gas from producing field to market, were installed in the course of the expansion program.

In addition to expanding its transmission capacity, Texas Illinois is erecting a pipe line suspension bridge over the Mississippi River. The site of the bridge is near the company's existing multiple underwater crossing at Grand Tower, Ill. Exploratory work on the location of the bridge was begun in 1950, but construction was deferred at that time because of material shortages. It is anticipated that the bridge will be completed in 1954 and will cost about $3,800,000.

Sunray Completes 75 Miles Of 475-Mile Project

Sunray Oil Corporation, Tulsa, has announced that the first 75 miles in the Oklahoma Mississippi River Products Line, Inc. 475-mile pipe line project has been completed by Williams Bros., contractors. Scheduled for completion during mid-summer, this line will connect Sunray's catalytic cracking refineries at Sunray Village (Duncan) Okla. with a Mississippi River terminal at West Memphis, Ark.

The segment of the line already laid is from West Memphis westward across the White and St. Francis Rivers. The pipe line will give Sunray and other Oklahoma refiners a new direct market outlet to the Mississippi River Valley.

Texas Eastern Purchases Triangle Pipe Line Stock

Negotiations were completed February 12 by Texas Eastern Production Corporation for the purchase of all the stock of Triangle Pipeline Company at a cost of $3,195,040.

Triangle, a Delaware corporation, is engaged in transporting petroleum products from East Texas, North Louisiana and South Louisiana gasoline plants and refineries to various points on its pipe line system, which extends to a water terminal on the Mississippi River at Arkansas City, Arkansas.

Texas Eastern plans no changes in Triangle's personnel or organization.

Sarnia Products Line Increases Capacity

An expansion program which will boost the carrying capacity of Imperial Oil Limited's 188-mile Sarnia products line by 40 percent has been announced. The $1 million construction project, which includes two new pumping stations, will raise the throughput of the line from 39,000 to 55,000 barrels a day.

The products line carries gasoline, diesel oil and heating oil from Imperial's Sarnia refinery to London, Hamilton and Toronto. Pumping stations will be built at London and at Waterdown, where spur lines for Hamilton leave the main line. Construction begins in the spring and the project is expected to be finished by fall of 1954.

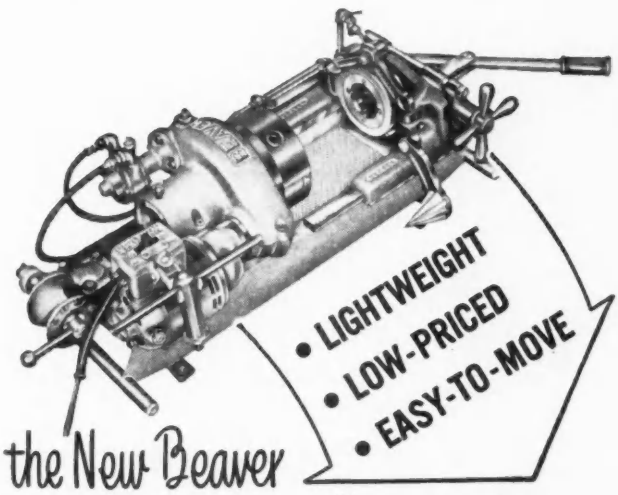
Magnolia Plans 208-Mile Line With Automatic Metering

A new 208-mile, 20-inch crude oil pipe line with an initial pumping capacity of 122,000 barrels daily will be built by Magnolia Pipe Line Company from Corsicana to Beaumont, Texas.

Construction is due to begin some time during the second quarter of the year. The project will take about six months to complete.

Meter installations will be made at Beaumont where oil delivered to Magnolia's refinery there will be measured by automatic metered instruments instead of by tank gauges. Six 122,500-barrel tanks with connecting pipe lines will be built at the refinery.

New pumping equipment will be installed at Corsicana, together with necessary tank farm lines and two new 120,000-barrel tanks. Plans are being drawn so the pumping capacity of the line can be ultimately increased to 165,000 barrels of oil per day by constructing an additional pump station on the line.



the New Beaver Model-E Pipe and Bolt Machine

The new low-priced, lightweight Beaver Model "E" is a "junior edition" of the heavy-duty Beaver Model A—which has, for the past 20 years, been the recognized leader in the field of portable pipe and bolt machines.

Although designed primarily for hardware stores and small piping contractors and industrialists, BIG contractors will find the new Model "E" useful on jobs requiring extreme portability.

A pipe machine is no better than the service back of it and our 50 years of experience in this field, and our reputation for high quality and friendly service, is your best guarantee of complete satisfaction.

WRITE FOR BULLETIN E

BEAVER PIPE TOOLS

254-300 DANA AVENUE • WARREN, OHIO, U. S. A.

MULTIPLE OFFICES mean BETTER SERVICE

NORTH AMERICA
EDMONTON
TORONTO
TULSA
MINNEAPOLIS
NEW YORK
LOUISVILLE
WASHINGTON
ATLANTA
HOUSTON
NEW ORLEANS

EXPERIENCE means BETTER PIPE LINES

SOUTH AMERICA
CARACAS
MARACAIBO
BOGOTA
LA PAZ
RIO DE JANEIRO

MAIN OFFICE: TULSA

Pipelines are NOT sidelines with

WILLIAMS BROTHERS

ENGINEERS
CONTRACTORS

OIL • GAS • PRODUCTS • WATER
PIPELINES AND PUMPING STATIONS

Write your nearest Williams Brothers office

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

Weld Cap Guides Coating and Wrapping Machine on End of Pipe

An oversized well cap with the center removed makes an excellent tool for guiding the coating and wrapping machine onto the open end of pipe. It eliminates the danger of damaging the bevel. The well cap need not be the manufactured type—an "orange peel" will do just as well. The center portion of the cap is cut out to make it lighter and a handle made of pipe or steel bar is welded across to the opening as shown.

The inside of the well cap should be lined with some kind of padding such as rock shield to protect the bevel. To use this device, simply slip it over the open end of the pipe and then run the wrapping machine over it. Start the machine, then after it has progressed down the pipe, remove the cap.

Support Adjusts Tank On Uneven Flooring

A three-legged support, adjustable to permit adapting the lubricating oil storage tank to uneven floor or ground, is used by one company at one of their field crude oil gathering pump stations. The three legs, of two-inch pipe, slide up or down through sleeves of 2½-inch pipe, the latter welded to the cylindrical tank at the bottom. A threaded fitting and set screw in each sleeve permits adjusting and locking of each leg in the desired position after the tank has been levelled.

Such a unit, representing only slightly more time and effort to construct, is suited to temporary installations or wherever uneven flooring or terrain otherwise might require cutting and levelling of a conventional

A fleet of Allis-Chalmers hydraulic torque converter tractors, with sidebooms, operated by Collins Construction Company, handled the pipe on all operations preparatory to launching. First they eased 27-foot, 4,500-lb. sections of pipe into position, for welding. The sections were then welded into a 2,500-foot, 2,000-ton unit, which seven of the tractors lifted and cradled for cleaning-priming and doping-wrapping machines. As each of the 2,500-foot sections was wrapped, an Allis-Chalmers hydraulic torque converter tractor picked the dope and wrap machines off the pipe and hurried them to the next section. After doping-wrapping was completed, the seven-tractor fleet carried the 2,500-foot long sections to the launching site.

Smooth Precision Pays Off

On all of the operations the stability and smooth operation of the powerful hydraulic torque converter tractors stood out. For example, on moving the 2,500-foot sections of pipe, the seven torque converter tractors started smoothly, automatically matching speed and power to load requirements. With no shifting necessary, they worked as a single unit while easing the load to the pipe launcher. This exceptional coordination was a big factor in moving the eight 2,000-ton sections into place.

Briefly, this is the story of Allis-Chalmers tractors on the Mackinac job — and, in tractor performance, a story which is repeated daily on pipeline jobs wherever Allis-Chalmers hydraulic torque converter tractors are working. Your Allis-Chalmers dealer invites you to get the full story, and to see these tractors in action.

Allis-Chalmers HD-20
Hydraulic Torque Converter Tractor
Weight, 41,000 lb. — 175 net hp. at flywheel.

Here two Allis-Chalmers hydraulic torque converter tractors are shown lowering a string of pipe into the launching way. In soft muddy going, the combination of torque converter drive and unusual flotation permit these tractors to creep along without miring down.

— Collins Construction Co. photo

Hydraulic torque converter drive makes it amazingly simple for operator to match cradling speed to cleaning-priming, doping-wrapping machines. This is particularly important when operating on steep hillsides or in poor ground conditions.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U.S.A.

You can cut "UNACCOUNTABLE LOSSES!"

FIG. 2500 SERIES GAUGE HEAD

If your process involves the storage of liquids in tanks, then one of the first places to look for an "unaccountable loss" is in the gauging of your tanks.

"VAREC" Automatic Tank Gauging applies a new principle to a time-tested method of gauge operation that assures dependable accuracy and simplified reading. It will also save time and manpower. There is "VAREC" Automatic Gauging Equipment for high and low pressures and all gauging requirements.

Plan this money-saving step today, send for full details on "VAREC" Automatic Gauging Equipment. Fill out this convenient coupon or request on your letterhead.

"Varec" PROVED and APPROVED

THE VAPOR RECOVERY SYSTEMS COMPANY

COMPTON, CALIFORNIA

Cable Address: VAREC COMPTON (CAL. U.S.A.) All Codes

SALES OFFICE AT:

Boston 11, Mass.	Minneapolis, Minn.	St. Louis 20, Mo.
Chicago 6, Ill.	New York 7, N. Y.	Seattle, Wash.
Detroit 26, Mich.	Pittsburgh 19, Pa.	Tulsa 9, Okla.
Houston, Texas	San Francisco, Calif.	

FOREIGN SALES AGENCIES AT:

ARGENTINA, Buenos Aires	H. Hennequin & Cia. Av. Belgrano 881
BELGIUM, Brussels	Etab. Emeric Kroch, 75 Blvd. Clovis
BRAZIL, Rio de Janerio	Sociedad Importadora de Equip., Av. Calogeras No. 15-7 S/708
CANADA, Montreal	Peacock Bros. Ltd. Town of La Salle
CANADA, Toronto	J. F. Comer Co., 508 Federal Bldg., 85 Richmond St. West
HAWAII, Honolulu	Allan R. Duvall, 1171 Hopaka St., P.O. Box 33
HOLLAND, Amsterdam C	Comprimo N. V. Amstel 21C
JAPAN, Tokyo	American Japan Trading Co., 213 Chrom Ginza Chuo-Ku
MEXICO, Mexico City 4, D.F.	Schultz y Cia., S. A., Col. San Rafael, Sullivan 119
SWEDEN, Stockholm	Kemi-Intressen, P.O. Box 16363
SWITZERLAND, Zurich	Urania-Acessories, Newmuhlequai 24
VENEZUELA, Barcelona	Waldrip-Campbell, Apartado 30
VENEZUELA, Marcaibo	Waldrip-Campbell, Apartado de Correo 594

FOREIGN MANUFACTURING LICENSEES:

ENGLAND, London	Wm. Neil & Son, Ltd., 38 Victoria St. S.W.1.
FRANCE, Paris	Compagnie Tech. des Petroles, 134 Blvd. Haussman

MAIL COUPON NOW FOR NEW BULLETIN CP-3501

"Varec" PROVED and APPROVED

THE VAPOR RECOVERY SYSTEMS COMPANY
2820 N. Alameda Street, P. O. Box 231
Compton, California, U.S.A.

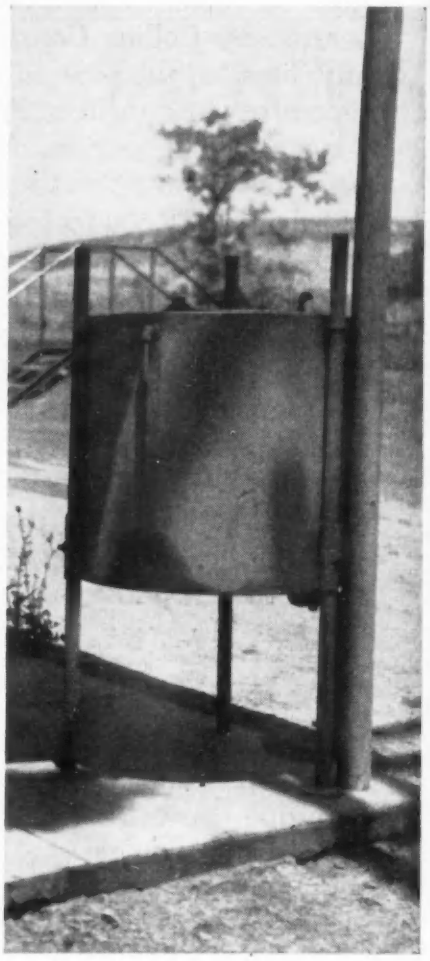
Company Name_____

Name_____ Title_____

St. and No._____

City and State_____ 25-1

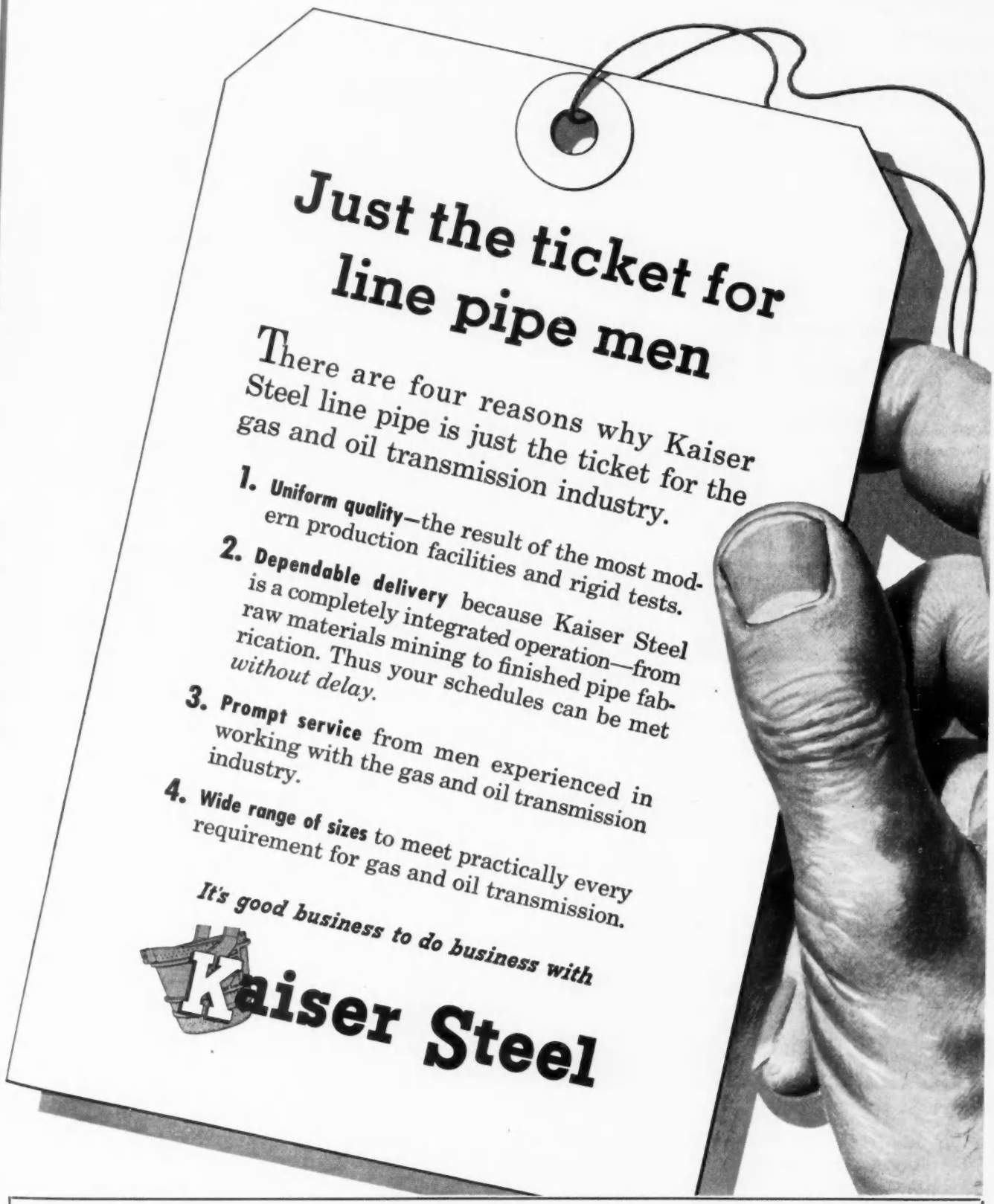
HINTS . . .



storage tank. When transported from one location to another, the present tank, with legs removed, can be handled more easily and with little danger that legs will be bent or damaged.

How to Get Free Index of 1953 WORLD OIL

The complete editorial index covering all issues of WORLD OIL published during 1953 has been prepared and is bound separately in convenient pamphlet form. It will be sent free *to all subscribers* who write requesting copies. All you have to do is to refer to the Reader Service blue postcards (on Pages 281-282), fill in your name, company, position and address and add the words: "Send Index." Mail the postage prepaid card and the Index will be sent you.


Just the ticket for line pipe men
There are four reasons why Kaiser Steel line pipe is just the ticket for the gas and oil transmission industry.
1. Uniform quality—the result of the most modern production facilities and rigid tests.
2. Dependable delivery because Kaiser Steel is a completely integrated operation—from raw materials mining to finished pipe fabrication. Thus your schedules can be met without delay.
3. Prompt service from men experienced in working with the gas and oil transmission industry.
4. Wide range of sizes to meet practically every requirement for gas and oil transmission.
It's good business to do business with
Kaiser Steel

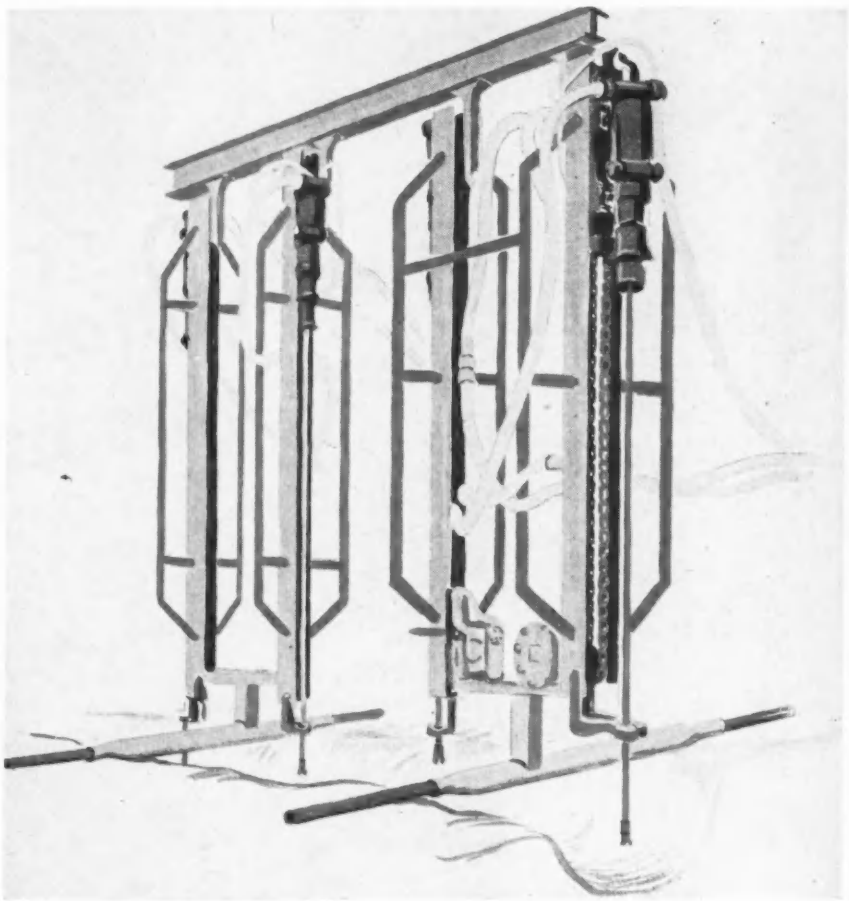
KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Houston, Tulsa, New York

Framework Supports Pneumatic Drills

A framework which is supported by two pieces of extra heavy steel pipe resting across the ditch is the carriage for a four-gang wagon drill assembly. The framework is self-supported and is balanced in such a way that while the drills are in operation they are stable and self-supporting. Unlike most wagon drill assemblies which are supported by wire rope from a side boom, these drills are not subject to lateral movement and because of this stability during drilling, there are fewer lost bits in the course of operations.



The framework which is illustrated is made of channel iron, I-beam and pipe. The I-beam at the top is the spreader for the sling which lifts the assembly.

The four vertical channel iron members are from the original wagon assembly. These are reinforced with pipe strong-backs as shown. At the bottom of each vertical channel iron is a cross member which ties into the supporting legs.

Note that the center sections of the pipe across the ditch are heavier than the pipe which spans the ditch.

As the drilling along the ditch progresses the assembly is picked up moved down the ditch by a side boom tractor which also pulls two air compressors which power the drills.

GUNITE
Since 1915
CONCRETE
SAND AND CEMENT
"Placed by Air"

We own and operate 43 complete cement gun outfits. We have completed over 2600 exclusive GUNITE contracts.

Send for specifications and bulletins
No obligation
See our catalog in Sweets

GUNITE CONCRETE & CONST. CO.
1301 WOODSWETHER RD., KANSAS CITY 5, MO.
2016 W. WALNUT, CHICAGO 12. ILL.
2036 ADDISON, HOUSTON 25, TEXAS
St. Louis—Minneapolis—Denver—New Orleans

install
peak performance
into your
compressors (AIR • GAS • AMMONIA)

J. H. H. VOSS VALVES
REG. U.S. PAT. OFF.

Peak performance, maximum efficiency, greater output, and lower power costs can be built into your oldest, and of course your newest, compressors by the installation of VOSS VALVES.

Check THESE VOSS VALVE ADVANTAGES:

✓ Quiet, vibration-free operation ✓ 20 to 60% more valve area ✓ less power consumption ✓ minimum pressure loss ✓ normal discharge temperature ✓ lower operating costs ✓ utmost safety

Our detailed proposal for increasing the efficiency of your compressor will be sent you without obligation. Send us the name, bore, stroke, and speed of your machine.

VOSS VALVES / J. H. H. VOSS Co., Inc. 784 East 144th Street, New York 54, N. Y.

After 23 years . . . you can read Roy E. Leigh's revealing report on Russia . . .

Beginning next month in WORLD OIL . . .

The Story We 'Killed' That Men Might Live

In the International Section of World Oil's April issue will appear the first of two parts of a manuscript which has lain for more than 23 years awaiting publication—and that fact alone makes a story!

In 1930, Roy E. Leigh reached Russia in the course of an extensive tour of all the oil-producing countries of the world, the greatest editorial project ever undertaken by any trade journal, up to that time. As Foreign Editor of The Oil Weekly, predecessor of World Oil, he was one of that first small group of American reporters for whom the Russian frontier was opened, briefly, at a time when the Soviet rulers sought improved relations abroad as an essential feature of their campaign for diplomatic recognition, foreign credits and American technical assistance in the first Five-Year Plan.

Stalin had just come to power, striding over the dead bodies of old friends and former comrades in intrigue, while old Bolsheviks lay in prison, being processed, brain-washed, and even fattened for the first of that long series of mass trials featuring self accusation, which in later years were to prove so puzzling to outside observers.

In those days, a warranty deed served as a death warrant; and millions of land-owning farmers were transported to Siberia or herded into barbed-wire enclosures which would have made Dachau look like a Sunday school picnic.

What Russians Wanted. Opposition had been overcome, and the program of collectivization and industrialization was picking up momentum. Russian leaders wanted outside observers to report the material progress which had been accomplished. Leigh was made to realize that his impressions and reports were expected to be exclusively favorable. Also, he had glimpses of thought-control and censorship; but that is another story.

He saw more than he was shown, and sensed more than he was told. In the oil fields, he was equipped to evaluate what he saw.

He breathed the stifling atmosphere of a vast penal institution and partook of the attitude of fear and apprehension in which the people spent their daily lives. He was in some respects deceived, as when he was told that penned up farmers had been herded into barbed-wire compounds "for more efficient famine relief." Full recognition of the grisly purpose of such institutions came later. Thus, the "unpublished manuscript" represents only the first impressions of a free-born American, slow to accept the basic idea of a nation of slaves.

In due course, his work in Russia at an end, his baggage was searched, his papers were censored, and his money was confiscated—not for any special offense but simply as a feature of Soviet regulations, currency control, etc,; and, without a cent of money of any kind, knowing not a word of the Persian language, he was put across the border of the country now called Iran.

Story Unfolds. On reaching Teheran, he sat down to his typewriter, then somewhat battered after 40,000 miles, and began to write of some of the impressions which he had not dared to commit to paper while within reach of the GPU, as the secret police were then called.

As will be revealed in the opening paragraphs; he wrote for publication; but, as the words fell into place on the platen of his typewriter, certain misgivings arose. His thoughts reverted to the oil men of various nationalities, American as well as Russian and European, who had been his hosts and his guides, oil men like himself, any and all of whom might have been compromised merely by contact with the author of a critical report.

By then, he knew something of the manner in which Soviet citizens were "liquidated" or punished for slight offenses; and he had learned of the theory of secondary guilt involving relatives, friends, and associates of accused persons. Considerations of humanity, of personal regard for individual oil men, overcame the instincts of the reporter. After all, he was and is more of an oil man than a writer.

The manuscript was forwarded to this Publisher, as he felt in duty bound; but a personal appeal was pinned to it. This letter has been lost, but its contents are well remembered.

The commissars, he wrote, might put blame upon those who had had contact with him. Good men might suffer.

Oil men should not be jeopardized by an act of his. He did not want a part in their possible destruction.

Nor did we.

The Publisher did not want the blood of these men on his hands, either. So, save for its reproduction in mimeographed form as a confidential document for Gulf Publishing Company employes and a few friends, it lay unpublished.

But not forgotten.

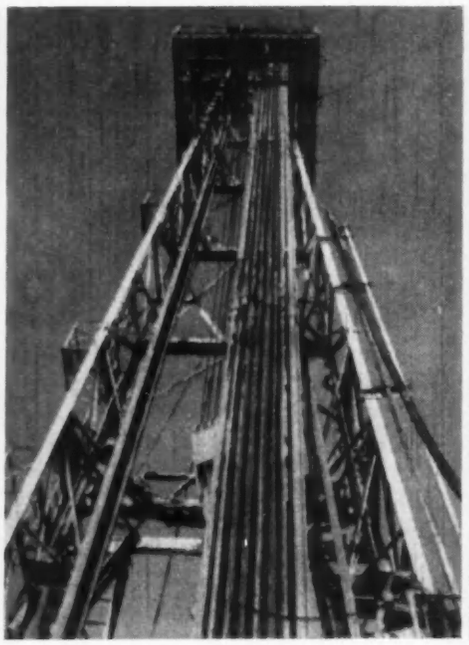
After some search, a copy was found in Leigh's personal files. It was faded and torn in spots and on the margin he made some notations, as he re-checked it in 1953. These notations are indicated by italics in the story.

Still Good Picture. You will find it intensely interesting today.

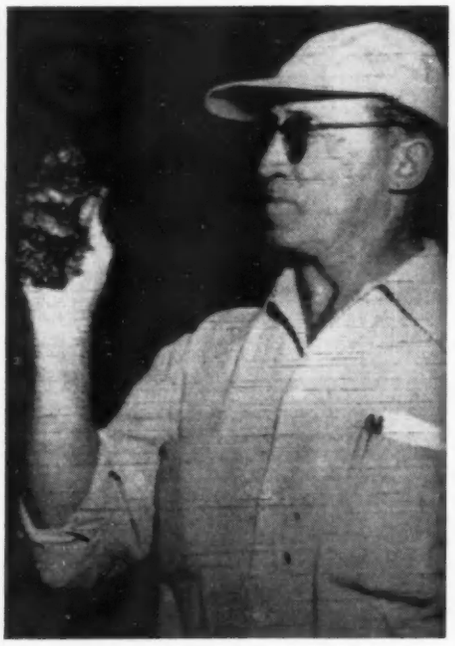
We are publishing it because apparently it still is a pretty good picture of Communist Russia. We are publishing it because it certainly shows what Russia has moved from in 1930, insofar as she may have moved. We publish it because it shows the impressions which the baby Communist monster made upon a mature American; and we publish it because, as we re-read it after 23 years, we knew it was too good a story to escape publication for all time.

RAY L. DUDLEY,
Publisher, World Oil

1. The hole . . .



2. The derrick . . .



3. The evidence

Oil Has Come Up From Down Under

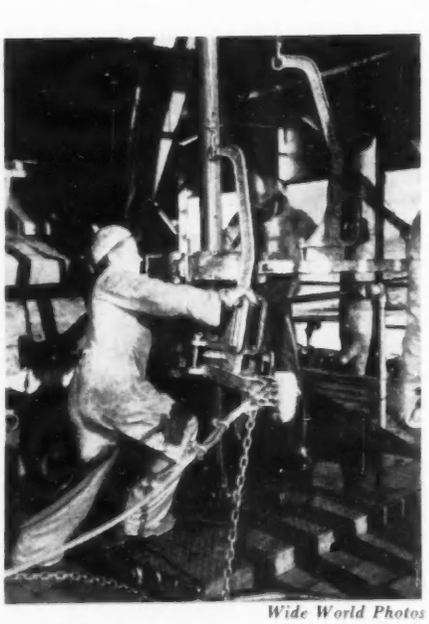
Rough Range 1's 23 barrels an hour has created interest in the search for oil in Australia.

THE DISCOVERY of what appears to to be the first commercial quantities of crude ever found in Australia has stirred the nation, created extensive world-wide interest and has been followed by a joint move by three overseas oil companies to extend the search for oil on the continent.

Meanwhile, West Australian Petroleum, Ltd., whose exploratory efforts resulted in the discovery of a high grade waxy crude at a depth of 3605-3620 feet in an isolated section of the West Coast, about 600 miles north of Perth, has decided not to begin producing immediately. Instead, the company will continue drilling to 12,000 feet to test lower horizons.

After Rough Range 1 was tested at 23 barrels an hour, news of the discovery swept through oil centers throughout the world. Shortly afterward, Anglo-Iranian Oil Company, Ltd.; Vacuum Oil Company, a subsidiary of Standard Vacuum Oil Company of New York; and Zinc Corp., Ltd., a large Australian mining company, announced plans to intensify the search for oil on the continent.

West Australian Petroleum is owned 80 percent by California Texas Corporation (Caltex) and 20 percent by Ampol Petroleum Ltd. Standard Oil Company of California has 50 percent interest in Caltex.



Wide World Photos

4. Tripping out

Ampol holds concession right permits covering 325,000 acres square miles in Western Australia, covering practically all of the coastal area. The country's petroleum law allows two-year exploration permits, with right of annual extension. Upon discovery of oil, application may be made for oil leases which continue for 21 years and offer renewal rights.

Royalty on oil produced is paid to the government, and the government's pact with West Australian Petroleum calls for five percent royalty on the gross value of the crude for the initial 15 years, then 10 percent.

Australia now uses about 100,000 barrels of petroleum products daily, all of which must be imported. The imports come from the Persian Gulf and Indonesia. **—The End.**

Middle East Oil Still Growing

Meaning . . .

- **A more difficult Iranian situation**
- **Continued pressure on world crude prices**
- **And a handicap to oil producers elsewhere**

By ROBERT E. SPANN, WORLD OIL Staff

MIDDLE EAST OIL producers set new records in all phases of operations in 1953. The new peaks were reached at a time when petroleum availability outstrips demand and when producible capacity will be further boosted.

Significance of the rapid growth in Persian Gulf petroleum operations is that it will become increasingly more difficult—though not impossible—to make room in existing supply channels for Iranian oil in substantial volume, even though it may be fully a year before export shipments from Iran could be resumed under the multi-company operating plan now under discussion.

It also means that the increasing availability of Middle East oil will continue to be a threat to firm petroleum prices in foreign areas as well as in U. S. oil fields. Excess producible capacity above current producing rates in the Middle East currently is estimated at upwards of 1.5 million barrels daily in addition to closed-in and surplus productive capacity elsewhere in the world—notably the U. S. and Venezuela.

The future crude petroleum pricing pattern will be made in the Middle East and not in the U. S., the largest consuming nation.

It further signifies that U. S., Canadian and Venezuelan producers will be limited to some extent in their operations by the availability of lower-cost Middle East oil, aided by present low tanker rates, for Western Hemisphere markets. Imports of Middle East crude into the U. S. last year increased 42 percent over 1952 and amounted to 20 percent of total U. S. petroleum imports.

The trend of developments in the Middle East, as indicated by the results achieved in 1953, give some proof that the most optimistic estimates of geologists a decade ago may be realized. The petroleum reserves yet to be found may eventually double present qualified estimates.

Highlights of the 1953 operations in the area were:

- Production from the nations bordering on the Persian Gulf amounted to 887,234,000 barrels, or a daily average of 2,431,000 barrels. Included in this figure is an estimated 9,890,000 barrels produced in Iran. The increase in Middle East production over 1952 amounted to 16 percent and was the largest annual rise since 1950.
- Drilling in the area exceeded the 1952 peak of 101 well completions, and particularly, exploration drilling and activities were extended to several new areas.
- It was probably the greatest year in additions to Middle East crude reserves. While new discoveries and extensions made last year are yet to be fully appraised, based on available data, WORLD OIL estimates the region's crude reserves total 79,075,000,000 barrels.

Broad Region of Oil. Four major discoveries made in the Persian Gulf vicinity in 1953 (see map) add evidence to the belief that some link exists in the vast chain of proven oil fields extending from Iraq's Ain Zalah and Kirkuk fields 1000 miles in a southeasterly direction to the east-central Arabian peninsula and covering a width of about 300 miles to the fields in southern Iraq and Iran.

The finding of new sources of oil in the Persian Gulf vicinity last year was highlighted by the discovery of the Wafra field at a depth of 3500 feet in March by American Independent Oil Company in the Kuwait-Saudi Arabia Neutral Zone on behalf of itself and Pacific Western Oil Corporation. Five wells capable of producing about 15,000 barrels daily had been completed by year's end and two rigs were operating in the field.

Basrah Petroleum Company, a member of the Iraq Petroleum Company group, made the second major discovery of the year with a wildcat well which showed oil at a depth of 10,000 feet at Rumaila in southern Iraq, 20 miles west of the company's Zubair field.

Petroleum Development Company, Ltd. (Trucial Coast), another Iraq Petroleum affiliate, in December tested oil in its Murban wildcat in Abu Dahbi, one of the seven small sheikdoms on the Trucial Coast of the eastern Arabian Peninsula. Previously, the company had drilled two dry wildcats in the area, one in Abu Dhabi and the other in adjoining Dubai.

The fourth discovery was made by Arabian American Oil Company at Huiya, about 15 miles south of the southern limit of the Uthmaniyah area of the vast Ghawar field and 15 miles north of the proven production in the Ain Haradh field. This completion is officially termed an extension by Aramco, though additional wells will be necessary to definitely prove its link with the Ghawar field, already considered the world's largest with a

Who Owns Middle East Oil?

Listed in order are the operating companies, 1953 production in barrels daily, and owning companies.

KUWAIT

Kuwait Oil Company

683,688 Barrels Daily

Anglo-Iranian Oil Company	50%
Gulf Oil Corporation	50%

SAUDI ARABIA

Arabian American Oil Company

844,641 Barrels Daily

Socony-Vacuum Oil Company	10%
Standard Oil Company of California	30%
Standard Oil Company (N. J.)	30%
The Texas Company	30%

IRAQ

Iraq Petroleum Company

Basrah Petroleum Company

Mosul Petroleum Company

576,159 Barrels Daily

Anglo-Iranian Oil Company	23.75%
Cia. Francaise des Petroles	23.75%
Royal Dutch Shell	23.75%
Socony-Vacuum Oil, Standard Oil (N. J.)	23.75%
C. S. Gulbenkian	5.00%

QATAR

Petroleum Development Company

89,115 Barrels Daily

Iraq Petroleum Company

BAHRAIN

Bahrain Petroleum Company

30,079 Barrels Daily

Standard Oil Company of California	50%
The Texas Company	50%

IRAN

650,000 Barrels Daily*

Iranian Government	50%
Anglo-Iranian Oil Company, Cia. Francaise des Petroles, Gulf Oil Corporation, Royal Dutch Shell, Socony-Vacuum Oil Company, Standard Oil Company of California, Standard Oil Company (N. J.), The Texas Company	50%

*Producible Capacity

NEUTRAL ZONE

American Independent Oil Company

15,000 Barrels Daily*

American Independent Oil Company	50%
Pacific Western Oil Corporation	50%

*Producible Capacity

American oil companies' share in the total output of the Middle East would be boosted substantially by the proposed basic plan for the resumption of petroleum production in Iran.

The seven largest international oil companies would form a "consortium" to handle the management of operations and marketing Iranian oil with the ownership of the industry remaining in the hands of the Iranian government. Profits from the operations would be split equally between the Iranian government and the multi-company group. Under the proposed basic plan of marketing Iranian production, 50 percent of the oil would be marketed by the five American companies in the group—Gulf Oil Corporation, Socony-Vacuum Oil Company, Standard Oil Company of California, Standard Oil Company (New Jersey) and The Texas Company.

Two British companies, Anglo-Iranian Oil Company and Royal Dutch/Shell Group, would market 45 percent of the Iranian oil and the remaining five percent would be marketed by the Iranian government company. The five American and two British companies would be joined in the "consortium" by a French company, Compagnie Francaise des Petroles.

Under the plan, Anglo-Iranian's claims for compensation for loss of properties in Iran would be referred to international arbitration and up to 25 percent of Iran's earnings from oil would be set aside to meet the British company's claims for compensation.

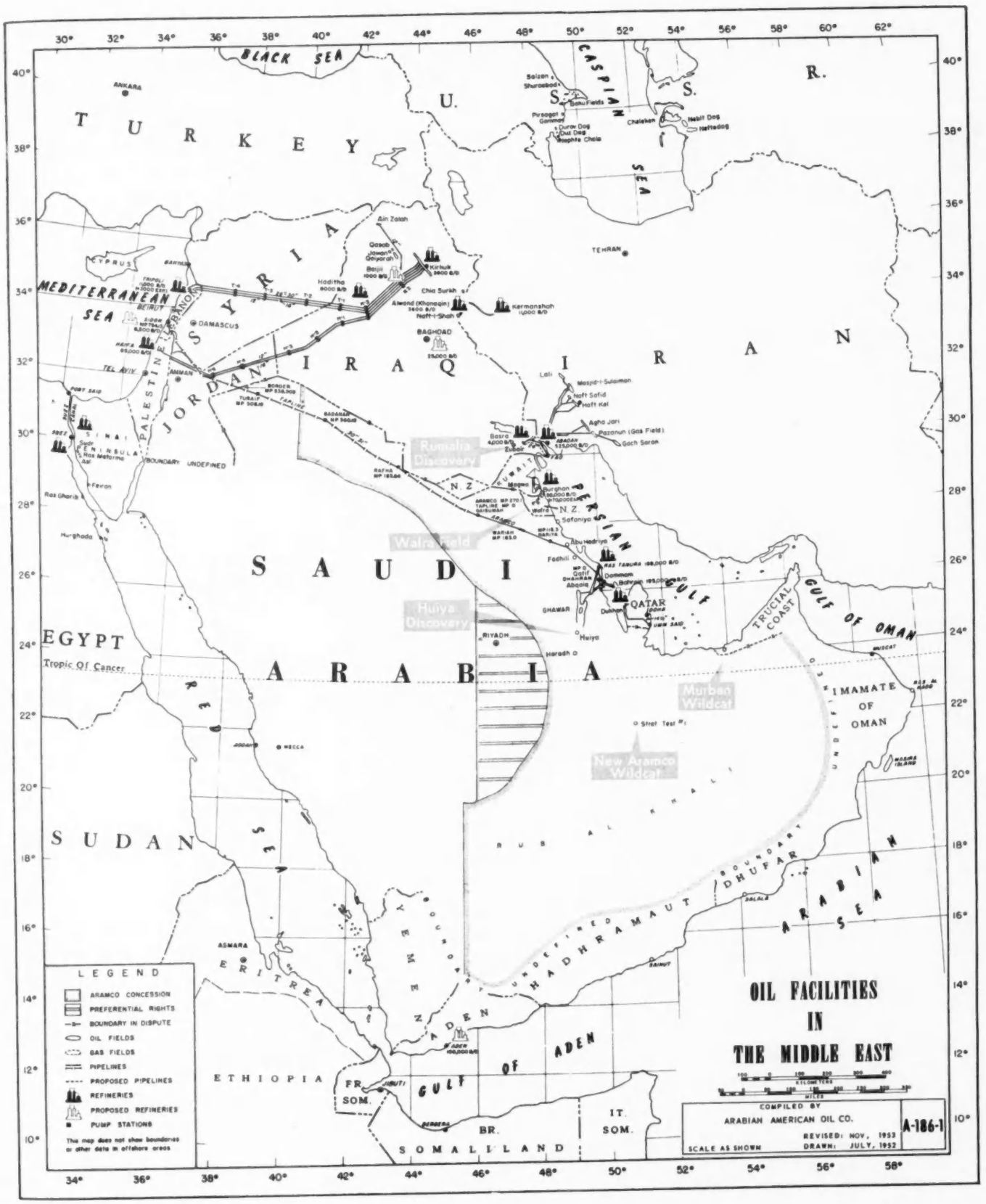
The proposal provides that production and marketing will be permitted without awaiting settlement of the compensation claims.

Under this proposed marketing arrangement, American companies which only a few years ago owned about 40 percent of the Middle East production, would be marketing one-half of the Iranian output.

proved area 85 miles long and up to 15 miles wide.

Exploration Activities Increasing. Successful results in the search for oil in the Middle East have encouraged present producers to step up exploration within their existing concessions and to seek new areas in which to conduct the search. It has also brought in new companies in the Middle East oil hunt.

Anglo-Iranian Oil Company, the first Middle East producer, which now participates with a one-half interest in Kuwait Oil Company, Ltd., and a 23.75 percent interest in operations of Iraq Petroleum and its subsidiaries,



FOUR MAJOR DISCOVERIES highlighted Middle East oil developments in 1953. Shown on the map, the discoveries were made in the Wafra field in the Neutral Zone by American Independent Oil Company; the Rumaila test in southern Iraq, 20 miles west of Basrah Petroleum Company's Zubair field; the discovery well of Petroleum Development, Ltd. (Trucial Coast) at Murban in the sheikhdom of Abu Dhabi on the Trucial Coast; and the Arabian American Oil Company wildcat at Huiya. Also, Aramco has started a wildcat test in the great southern desert Rub al Khali of Saudi Arabia.

last March acquired concession rights to the offshore areas off Abu Dhabi, the location of Petroleum Development's recent discovery. Also last year, Anglo-Iranian and Compagnie Francais des Petroles, a French company with a 23.75 percent interest in IPC, acquired offshore rights off Dubai.

Royal Dutch/Shell, another 23.75 percent owner of Iraq Petroleum, has offshore rights to the coastal waters surrounding Qatar. Cities Service Company and Richfield Oil Corporation recently acquired a concession covering the entire province of Dhofar in the sultanate of Muscat and Oman, bordering on the Arabian sea.

Several smaller oil companies commenced exploratory operations in Israel in 1953 under a new petroleum law and Pacific Western Oil, in partnership with an independent operator, holds a concession in Lebanon, though the test well on this acreage was unsuccessful in 1953.

Within present producing concessions, Basrah Petroleum has additional exploratory operations underway in southern Iraq; new tests are planned for Qatar, and Aramco in December spudded in its first wildcat test in the great southern desert, Rub al Khali, in Saudi Arabia, some 200 miles south of its Uthmaniyah producing area.

Cutbacks Would Be Difficult. With the increase in crude oil availability in the Middle East, particularly in the countries and shiekdoms not previously producers, the competition for markets will become more intense. Producers with the highest dollar cost will suffer at the gain of those able to sell mostly for sterling and other soft currencies.

The plan being negotiated for a resumption of Iranian oil operations that would permit a group of international companies to manage and market the production and split profits 50-50 with the Iranian government offers the only realistic solution to a settlement of this dispute. But return of Iranian oil will require some adjustments in other countries, and the eight possible participants in the Iranian plan will have problems to handle in other Middle East countries where they now produce.

The adjustments, or cutbacks, that will be required to make room for Iranian oil will be the most difficult issue in the success of the plan, if accepted. Under existing contracts between producers and countries, any decline in production would mean a reduction in royalties and income taxes to Middle East kings and sheiks. Should such occur there are no assurance that the present 50-50 profit sharing agreements would be suitable to producing nations.

There is already one long-standing demand from Saudi Arabia that its contract with Aramco be revised to base the royalty payment on the basis of present posted prices ($1.97 a barrel at Ras Tanura) in place of the long-term contracted inter-company price of $1.43 a barrel. This is the price which Aramco's offtakers, the four owning companies, pay for Saudi Arabia crude.

More Markets Needed. Meanwhile, there is new Middle East oil seeking markets, such as the Aminoil-Pacific Western production from its Wafra field of the Neutral Zone. Additional Iraqi oil from the Kirkuk field could be made available if the Iraqi government's demands that the inoperable 12- and 16-inch pipe lines from Kirkuk to Haifa, Israel, be removed and diverted to an Arab Mediterranean port. These lines have not been used since the start of the Arab-Israeli war and have a combined capacity of 160,000 barrels daily.

Should they be placed in service to an Arab port in Syria or Lebanon, where IPC now has three lines in operation, the company's delivery capacity to the Mediterranean would be boosted from 475,000 to 635,000 barrels daily. Presently additional existing pipe line outlet for Middle East crude to the Mediterranean is Trans-Arabian Pipe Line from Saudi Arabia to Sidon, Lebanon. The remaining Middle East crude reaches markets from tanker terminals in the Persian Gulf in Bahrain, Iran (when operating), Iraq, Kuwait (including Neutral Zone production), Qatar and Saudi Arabia.

New Top Producer. Kuwait moved into first place among Middle East oil producers, surpassing Saudi Arabia, and fourth in the world after the U. S. Venezuela and Russia. Kuwait Oil Company is now the largest oil producing company in the world, exclusive of the Russian government, having replaced Aramco. Kuwait's production last year totaled 315,246,000 barrels, or an average of 863,688 barrels daily. It was a 15.6 percent increase over 1952 and amounted to 35 percent of the total output of the Middle East.

The second largest producer was Saudi Arabia, with output of 308,294,000 barrels, or an average of 844,641 barrels per day, a gain of 2.4 percent over 1952. The largest percentage increase was made by the third ranking nation, Iraq, which had a gain of 50 percent from 1952 with a total of 210,298,000 barrels, an average of 576,159 barrels daily. The big increase here was a result of the full-year operation of the Kirkuk to Banias, Syria, 30-inch pipe line.

Qatar registered a gain of 29 percent in production last year with the total reaching 32,527,000 barrels, or 89,115 barrels daily; Bahrain's output held steady at an average of 30,079 barrels daily, and Iran had an estimated average of 27,096 barrels daily after deducting recycled oil.

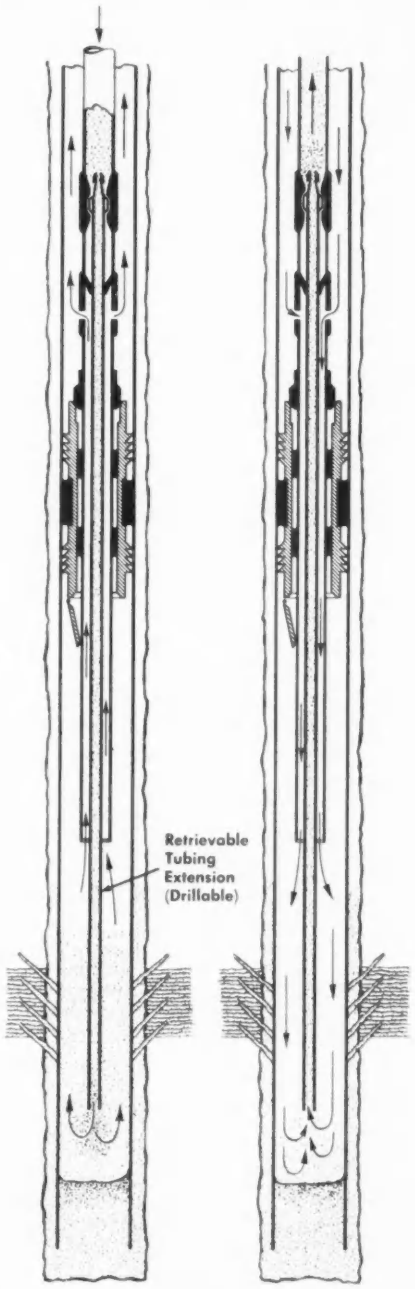
Exportable surplus crude oil from the Middle East last year amounted to an average of almost 2.2 million barrels daily, of which an average of 220,000 barrels daily was imported into the U. S. Almost half of the Middle East imports to the U. S., or 108,000 barrels daily, came from Kuwait.

—The End.

How to Get Free Index of 1953 WORLD OIL

The complete editorial index covering all issues of WORLD OIL published during 1953 has been prepared and is bound separately in convenient pamphlet form. It will be sent free *to all subscribers* who write requesting copies. All you have to do is to refer to the Reader Service blue postcards (on pages 281-282), fill in your name, company, position and address and add the words: "Send Index." Mail the postage prepaid card and the Index will be sent you.

for Permanent-Type Well Completions

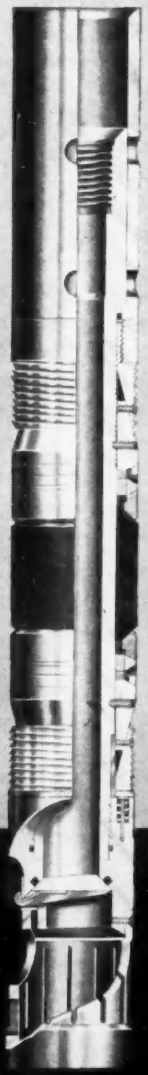


SQUEEZING REVERSING

BAKER PACKERS ADD PERMANENCE TO PERMANENT-TYPE WELL COMPLETIONS

When you select a Packer for a Permanent-Type Well Completion, remember this fact: of all the tools used in permanent-type well completions, only the *Packer* is required to be *permanent.* Guns, Extensions, Plugs, Gas-Lift and Circulating Valves can be removed or replaced on wire line... but the Packer, like the casing, is required to perform for the life of the selected producing intervals.

Baker Packer Completions are Permanent Completions from the standpoint of packer performance. Check these important advantages of the Baker Packer in Permanent-Type Well Completions:



· *Advantages of Baker Retainer Production Packer in Permanent-Type Well Completions:*

1. **PERMANENT, RELIABLE PACK-OFF will hold against any pressure differential from above or below that is safe for the casing.**
2. **FREE TUBING STRING . . . neither set-down tubing weight nor tubing tension required to achieve and maintain pack-off. Tubing can be anchored to Packer if desired.**
3. **CAN BE USED AS A SQUEEZE OR A PRODUCTION TOOL.**
4. **MEETS PERMANENT-TYPE WELL COMPLETION DIMENSIONAL REQUIREMENTS.**
5. **CAN BE SET ON WIRE LINE.**
6. **PERMITS EASY REMOVAL OF TUBING STRING.**
7. **READILY DRILLABLE IN CASE OF EMERGENCY OR NEED.**

BAKER OIL TOOLS, INC.
HOUSTON • LOS ANGELES • NEW YORK

BAKER

RETAINER PRODUCTION PACKER
PRODUCT NO. 415-D

RIG AND DRILL PIPE stacked in a materials yard at Havana at one time represented Cuba's latent hopes for oil production of her own. This equipment has been moved 300 miles southeast of Havana to drill a deep test near Jatibonico. Rig is only piece of heavy drilling equipment in Cuba. Acquired by the government to encourage nationals to drill for oil, it is now leased to a group of Cuban industrialists working with Kerr-McGee Oil Industries, Inc.

Cuban Hopes Center on a Wildcat

Kerr-McGee spurs the search for oil on company know-how and the enthusiasm of an island hungry for its own source of petroleum.

By ANTHONY GIBBON, WORLD OIL Staff

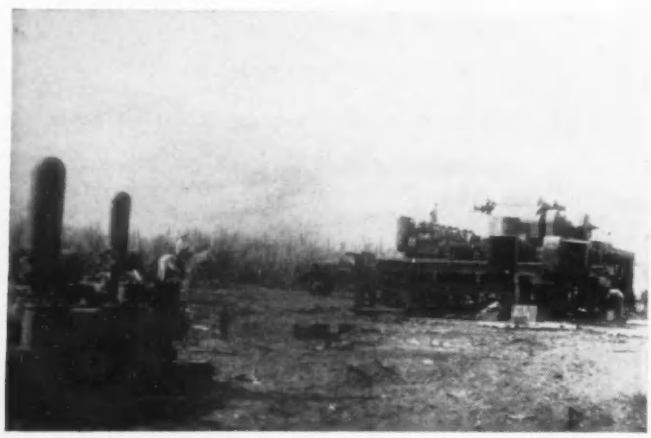
THE "POINT-4" program of rendering technical assistance to friendly nations has been translated into action by Kerr-McGee Oil Industries, Inc., of Oklahoma City.

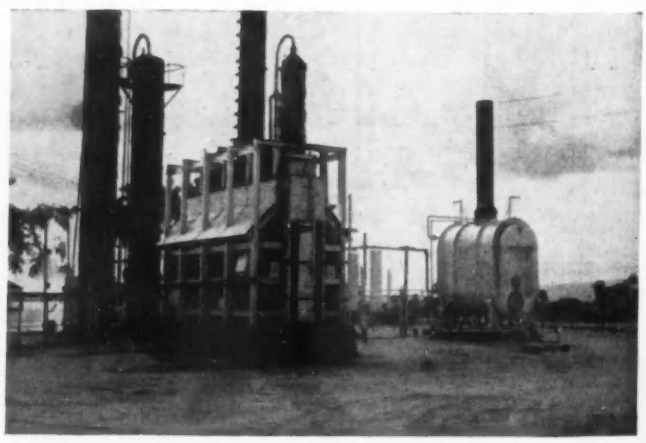
This internationally-minded, completely-integrated independent oil company recently concluded a contract with a group of Cuban industrialists resulting in Kermac exploration and drilling personnel being sent to Cuba to help develop a 27,774-acre concession in Camaguey Province.

Exact details of the contract are confidential, but a Kermac spokesman said the terms call for a "potential interest" in the event commercial production is found. Meanwhile: "We are providing all technical assistance, including geological and drilling services on a most advantageous basis for our Cuban friends."

Kerr-McGee is doing business with the "Jarahueca Group," a private company consisting of Cuban businessmen headed by Dr. Antonio Iglesias, prominent lawyer and man of affairs of Havana, and Señor Tito Mesa of Santa Clara, who is also president of the company.

"Their enthusiasm and apparent knowledge of the oil business, and their desire to develop the petro-





THE ECHEVARRIA 1, deep test near Jatibonico being rigged up (left). Well is being drilled by Kermac on a "potential interest" contract with Cuban industrialists. Right is the 1000-barrel-per-day refinery owned by Refineria Cabaiguan, S. A., which is controlled by the group with which Kermac is cooperating.

liferous resources of Cuba prompted us to enter into the contract," Dean A. McGee, executive vice-president of Kerr-McGee Oil Industries, Inc., said. "We hope to be instrumental in discovering substantial oil production on the island, and if successful, naturally expect to profit financially from the venture. Cuba is hungry for its own sources of petroleum products and represents a growing market. Meanwhile, we take pleasure and pride in having been approached to assist our Cuban friends with our technical and operational 'know-how.' "

Concessions Large. The Jarahueca Group has engaged in the oil business in Cuba for several years. It owns some production at Jarahueca and Motembo, small fields in Central Cuba, between Santa Clara Province and Havana. It also operates a 1000-barrel-a-day refinery at Cabaiguan in Las Villas Province, about 40 miles northeast of Jatibonico—site of their first wildcat which is being drilled by Kerr-McGee on the Dos Estrellas concession. Besides the more than 27,000 acres included in that concession, the group owns oil and gas concessions in many other parts of Cuba.

The Cabaiguan refinery was built shortly after World War II, later acquired by the Jarahueca Group and is operated by the Refineria Cabaiguan, S. A. Bill King, an American, who helped organize the original company which built the plant, is a stockholder in the company and plant superintendent. The refinery manufactures and distributes gasoline, kerosine, gas oil, diesel and fuel oils.

Production Small. The 1000-barrel-per-day refinery operates primarily on imported crude although it processes some small production from the Jarahueca field, discovered in 1943. During 1952 four wells were completed in the field at depths ranging from 2400 to 2800 feet. Each is producing from eight to ten barrels daily of 38 gravity crude. Total production of the field in 1952 amounted to 48,000 barrels. Two wells were drilled in the field in 1953 to depths of 2500 and 2700 feet, respectively, and one was abandoned as dry.

Should commercial production be encountered on the Dos Estrellas concession the refinery would profit immensely. Meanwhile, Kermac technicians also are consulting with the Cuban group in connection with plans to improve the efficiency of the refinery operations.

Kerr-McGee and the Jarahueca Group entered into a contract last fall, and J. C. Finley, exploration manager, went to Cuba to confer with Dr. Pierre Butticaz of Switzerland, geological consultant for the Cuban group. A geological reconnaissance of the Dos Estrellas Concession was made and the petroliferous possibilities established.

Drilling Equipment. Last October, J. W. Bawcom, drilling engineer, and Ralph Head, materials control man for Kermac, went to Cuba to make arrangements to move and set up camp and drilling equipment at the location for Echevarria 1.

The Cuban industrialists, in the meantime, had contracted with the Cuban government for the lease, with an option to purchase, of a rotary rig which the government had acquired some years ago and which was stacked in a materials yard in Havana. The rig, capable of drilling to 10,000 feet, is equipped with three diesel powered motors, jackknife mast, its own cementing equipment and 10,000 feet of 4½-inch drill stem. It was acquired by the Cuban government to encourage its nationals to drill for oil on the island.

"Because of the lack of oil field trucking equipment, moving the rig to the location 300 miles away was quite a task," Bawcom said. "However, we found everyone most friendly and cooperative and after arranging for the use of seven trucks and trailers, we loaded the equipment and set out."

Cuban roads between Havana and Jatibonico where the first well was located, are not too good, but the Cuban drivers, averaging about 35 loads, covered the distance in about seven hours.

"American drivers would have taken about twice as long," Bawcom commented. He pointed out that the Central Highway, which spans the length of the island, has been torn up by the heavy loads which trucks carry and, apparently, there are no restrictions as to the maximum load a truck may carry. The government, however, is undertaking an extensive road repair program.

Echevarria 1 was located in the center of a huge sugar plantation, and the crew had to clear about two acres for the drill site to prevent a fire hazard. The American crews consist of three drillers and three derrick men, with W. L. (Buster) Golding of Oklahoma City, as drilling superintendent. They are quartered in a small house at Jatibonico which is about three miles from the location. Other crewmen are Cubans and as much Cuban labor as possible will be trained and used in the operations.

Basin Play. Location of Echevarria 1 is on the east limb of the Jatibonico-Ciego de Avila-Zaza Basin, to the northeast of the Trinidad Mountains and west of the Camaguey Uplift. It is on the northwest limb of this basin where the Jarahueca oil field (one of the three commercially productive fields in Cuba) is located. Likewise, it is postulated from the sections measured in the margins of the present basin that the sedimentary section, which may contain the accumulations of oil, is somewhat less thick than the section of the Zapata Basin to the west (from 8000 to 12,000 feet instead of 12,000 to 15,000 feet) with the thickness having been sacrificed in the Upper Cretaceous and Late Tertiary time.

Oil production to date in Cuba has been limited to Serpentine and Serpentine contacts; however, potential sedimentary reservoirs, including the Aptychus limestone (Lower Cretaceous) and younger sandstones, could exist at depths less than 7500 feet in this basin wherein Echevarria 1 is located.

The need for Cuba to develop its own sources of crude is very great. The country's economy is expanding rapidly and the political "climate" favors oil exploration activities with the government encouraging its nationals in every way.

Meantime, Kerr-McGee's broad foreign experience—in Mexico, Kuwait, Israel and Alaska—assures their Cuban partners a full measure of technological and engineering assistance.

Three important requirements, ample capital, enthusiasm and know-how are ingredients in Cuba's newest drilling program. All engaged in the venture hope to place Cuba on the oil map of the world.—**The End**

Mexico's Busy

Six new wildcats have been drilled despite the fact crude produced by newest discovery is being burned because of lack of storage facilities.

ALTHOUGH CRUDE produced by Mexico's newest field discovery—Angostura—is being burned because storage facilities have not been completed, Petroleos Mexicanos, the government oil agency, is continuing exploratory work.

Six new field wildcats have been drilled in the structural trend, and a second well now drilling in the Casa Blanca structure shows evidence of high gravity crude. Of these six completions, one in Casa Blanca, 11 miles northwest of Angostura, was dry; three at San Juan, 22 miles southeast of Angostura, were unproductive; and two were drilled in Los Mangos, four miles west of Angostura.

However, daily average production of the three successes out of five wells drilled on the Angostura structure by the close of the year is 1570 barrels of 15-gravity crude per well.

Present findings indicate that although the Upper Cretaceous limestone is slightly porous, fracturing plays an important role in oil accumulation. Continued exploration has shown a highly complex structural condition as well as an irregular distribution of limestone facies.

Major significance has been attached to Angostura field, for it is the first commercial field found in the Veracruz embayment. Successful completion of Angostura 2 resulted in daily yield of 2400 barrels at 4400 feet below the Papaloapan river basin. The discovery well is 40 miles southwest of Veracruz, Mexico's largest port. Nearest production is Poza Rica, 140 miles northwest in an entirely different geological province. To the southeast 160 miles lies the Isthmus of Tehuantepec, also a producing area.

Plans are under way to connect Angostura with the railroad to permit shipment to refineries in Tampico, 220 miles north. But in view of the inability of the Pemex plant there to process heavy crude already available, it is possible that this new supply will be exported or sold domestically for fuel.

The new area has favorable conditions for brisk development. The railroad, part of the Tehuantepec division of the government-owned National Railways, runs from Veracruz to the Isthmus, where it connects with the Tehuantepec line to link both oceans. Thus, shipments from Tierra Blanca, the nearest railhead, to Angostura 2, could travel north to Veracruz and on to Tampico, or south to the ports of Coatzacoalcos, on the Gulf of Mexico, or Salina Cruz, on the Pacific Ocean. Minatitlan refineries are near Coatzacoalcos.

Use of the Tehuantepec railway lines to transport oil would result in a coincidence 50 years in the making.

It would unite two widely divergent careers of a man instrumental in opening up Mexico, Weetman Pearson, Lord Cowdray. An Englishman, Pearson was the junior member of S. Pearson and Son, Limited, builders of the Isthmus railway that once rivaled the Panama Canal.

As an engineer working on the railway project in 1896, he first became aware of Mexico's oil resources and began investigations which led to the organization of "El Aguila" oil company.

Pearson's company played a major role in developing Mexican oil and it later became one of the foundations of Royal Dutch interests.

Thus, Pearson's railway—nationalized in 1905—may now carry oil that his El Aguila company—nationalized in 1938—first developed on a worldwide basis.

The highway bordering the Angostura structure runs from Veracruz to Tuxtepec city, which is on the rail line. Angostura 2 is about midway between the highway and the railroad.

A transportation possibility visualized but not yet explored is that offered by the nearby Papaloapan river, navigable to barges and small craft deep in the interior to its mouth in the Gulf at Alvarado.

Dual problems facing development at Angostura are the lack of refinery capacity and conveniently located pipe lines. Pemex plans a refinery at Veracruz, but this and new pipe lines will have to wait until the potential of Angostura and other structures in the trend are better known.

Considerable importance must be attributed to the increase in Mexico's oil production and reserves which the new field signifies.

During 1953, increase in production failed to keep pace with that of previous years, with a resulting sharp cut into the country's net surplus of crude for export.

There was apprehension about ability to meet future domestic demands.

Greatest contributing factor in this decline was conservation in the Poza Rica field. This reduction, from 154,000 barrels to 140,000 barrels daily, promises to be more than compensated for by the newly-located Angostura area as well as other recent discoveries.

Effect of this development on Mexico's oil exports is uncertain. Prime objective of the industry in recent times has been the production, refining and distribution of Mexican oil for Mexican consumers, with diminishing emphasis on exports. Rise in domestic consumption, plus a world market that Pemex describes as 15 percent oversupplied, is responsible.

But Pemex goals are not likely to change in the near future. Nevertheless, Pemex does envision boosting exports. It has been suggested that this new oil source will permit the supplying of Veracruz and adjacent areas with oil that, until now, has been brought from Tampico, thus permitting Tampico to concentrate on export. Such development, however, must await expansion of refinery capacity and transportation facilities.

—The End.

PERU BEACH SCENE at Zorritos, showing a derrick, a tank farm and a double pipe line paralleling the shoreline.

Peru Looks Seaward

The nation's new oil law places a heavy burden on development companies, but interest is running high anyway.

By DR. J. E. RASSMUSS, Consulting Geologist, Lima, Peru

AT THE TIME the strongly-disputed legislation on the tidelands in the U. S. was resolved, the submarine shelf was opened in Peru for private concessions—the first time such action was even taken in South America.

In the Peruvian petroleum law of March, 1952, the continental shelf is defined as the belt between the low tide limit of the coast and a line running 200 miles to the west. That law declared this zone a national reserve, subject to special conditions. By decree of April 24, 1953, the submarine shelf was opened for private concessions, and on May 15 regulations for granting such concessions were issued.

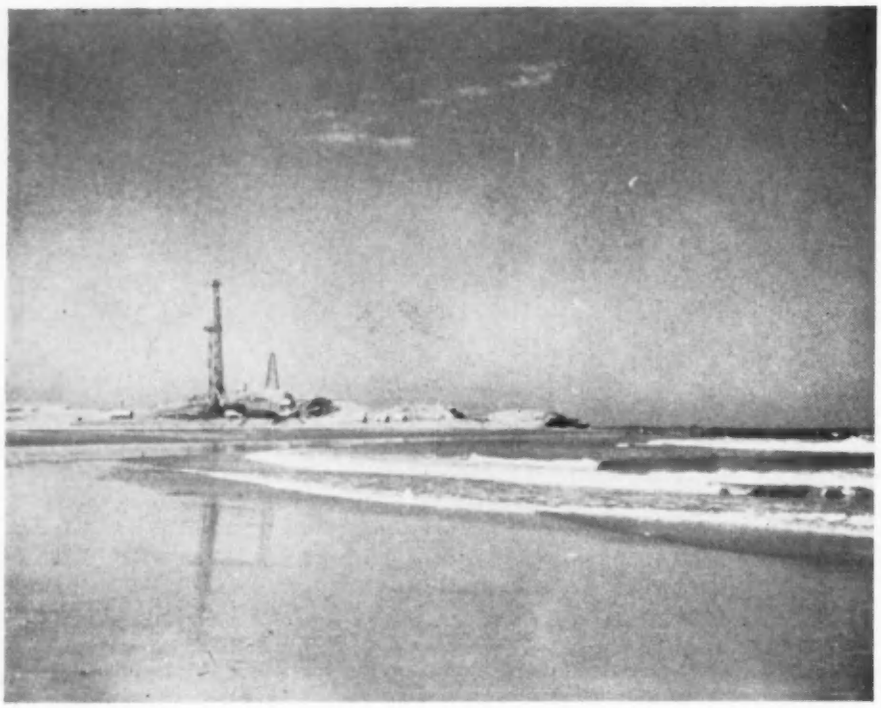
From the practical point of view, the shelf region of the northern coastal area of Peru has the advantage of a quiet sea, being situated in the tropical calm region. From the geological point of view, the continuation of favorable structures below sea level on the shelf is known. Several wells are situated in the sea near the shoreline at Zorritos, Restin and Lobitos. But for oil development, an ocean depth of 100 feet must be considered as the current limit of economically feasible development. Maximum depth of Lake Maracaibo in Venezuela is about 50 feet.

The strip of sea less than 100 feet deep is about two to three miles wide in the region from Cabo Blanco to Pariñas Point. It broadens to about six miles farther south and in the Sechura region. The submarine platform acquires considerable width to the south, in the latitude of the ports of Pimentel and Eten (7 degrees south), where the Lobos Islands rise from the shelf, reaching 30 to 40 miles, but the strong surf on the southern Sechura coast constitutes a serious obstacle. Oil patches off the Sechura coast have been seen and oil and an gas emanation exists west of Lobos de Afuera Island.

The northern part of the shelf, adjoining the concessions of Empresa Petrolera Fiscal to 4° 15′ southern latitude has remained reserved for the government. More or less from Cabo Blanco, the embarking point of the British Lobitos Company's El Alto field, to the south, the shelf has been opened for concessions and divided for this purpose in three zones.

Zone X comprises the shelf lying in front of the concessions of the Lobitos company and the La Brea-Pariñas concession of International Petroleum Company. This zone has been divided in two rows of 20 blocks each, each block covering an extension of 2.17 miles in north-south direction and 8.7 miles in east-west direction.

Because of the irregular shape of the coast line, the surface of eastern blocks, adjoining the coast, varies from around 10,000 to 12,000 acres, being the extension of the blocks of the western row, located completely in the ocean, of 12,107 acres. One block adjoining the coast can be applied for only together with the adjoining block in the ocean being therefore the minimum of a concession of about 25,000 acres and extending 17.4 miles into



OFFSHORE IN PERU. This is a Dunlap & Graham Drilling Company, Inc., drilling rig situated on Punta Lobitos, which is about half way between Cabo Blanco and the port of Talara, Peru. This well, being drilled for Douglas Oil Company of California, was drilling ahead at 4500 feet. According to Lester F. Rojas, drilling superintendent, progress has been "rather slow" because this is the first well of its type in the country and it has entailed considerable training on the part of local crew members. But, reports Rojas, "they are catching on to this type of drilling quite fast. Out of a clear sky, they immediately named a whipstock 'cuchara', which means spoon. So as long as this work continues in this part of the world, that's what it will be."

the sea. A drilling obligation of one foot per 2471 acres yearly is established during the exploration term, redeemable by the payment of about $13 per 2471 acres yearly.

Zone Y. In Zone Y, which comprises the Sechura coast from the southern boundary of IPC's concession to Bayovar, two corresponding rows of blocks are established. They have a double extension in length and width, i.e., 4.34 for 17.4 miles. Total extension in east-west direction reaches, therefore, 34.8 miles into the ocean and the surface of the blocks varies from 31,135 acres in the eastern row to 48,432 acres in the western row. Drilling obligations or redemption fees are reduced to 50 percent of those in the zone X.

Zone Z. Finally, in southern zone Z, quadrangles of 4.3 x 4.3 miles have been established, which only in the blocks adjoining the coast have irregular shape and one longer side, according to the contours of the shoreline. Four rows of these quadrangles have been located which means an extension of 17.4 miles into the sea in east-west direction. Drilling obligations are the same as in Zone Y or 50 percent of those of the first Zone X.

The concessions located according to the preceding rules will be granted to the applicant who offers the best conditions, i.e., the highest fixed advance on the income tax (royalty), established at 20 percent on the coast. In case of equal offers, the highest monetary premium will take precedence.

In each zone, the highest bid offered for one block will be considered as the minimum price for each other block of the same zone. In case of overlapping concessions, auction will take place.

For direct development concessions, which enjoy no specific preference, continuous drilling obligations of at least 1000 feet for each 100 acres are established, unless commercial oil is found at shallower depth.

After selecting, during exploration, the area of development, minimum continuous extension of the retained area is fixed at 1235 acres in each block.

Owners of concessions on the submarine shelf enjoy the right to make every necessary use of the neighboring land for installing equipment for exploration, carrying out inclined drilling from the coast, constructing buildings or shipping facilities and expropriating the ground for such purposes.

Conditions for the beginning of explorations on the submarine shelf, which by its natural conditions is an expensive enterprise at the outset, are heavy, especially because of the extension of the concession parcels far into the sea, which means considerable taxes in favor of the government.

Only after reducing during the exploration terms the applied areas to the appropriate volume, conditions are more bearable and more suitable for a sound development. Drilling obligations have been imposed to avoid the accumulation of idle reserves.

Depletion allowance of 25 percent for national and 15 percent for foreign companies constitutes one feature for development.

National companies have priority in applying for concessions during the first 60 days. After expiration, a term of 30 days had been fixed in the original decree for the applications of the foreign companies.

One new national company, Petrolera del Pacifico, organized with a capital of about $600,000, has presented a bid for ten concessions, comprising a total of 116,608 acres, covering blocks offshore of Cabo Blanco and offshore of Lobitos. Conditions offered by this company were 15 percent royalty or fixed advance on the income tax and a monetary premium of $300 for each concession.

Douglas Oil Company of California, which is reported as the operator of these offshore concessions of Petrolera del Pacifico, has also acquired a strip of sea, covering 1000 acres, included in the original concessions on the coast of Lobitos Oilfields, Ltd., by an agreement with the latter company.

The heavy drilling obligations for the continental shelf have prevented a more lively interest of the oil companies. By decree of October 4 a new term for applications by foreign companies for offshore concessions had been fixed at 60 days running from Oct. 5, 1953.

Douglas Oil spudded in November, 1953, the first offshore well in Lobitos bay by inclined drilling from the coast, which in January had attained a depth of more than 4500 feet, having struck some oil shows. —**The End**

YOU PICK THE SPOT

...WE'LL MAP IT!

WITH the airborne magnetometer, AERO crews are providing petroleum geologists with valuable information on surface trends and basement structures—helping to guide ground parties to most promising areas.

Wherever you plan exploration, call on our 35 years and over a million miles of world-wide mapping experience. AERO reconnaissance will put your exploration program months—even years ahead of schedule. AERO crews in Africa, the Middle East and Far East, South America, Canada and at home, are available for new assignments now.

AIRBORNE MAGNETOMETER SURVEYS • PRECISE AERIAL MOSAICS
TOPOGRAPHIC MAPS • PLANIMETRIC MAPS
RELIEF MODELS • SHORAN MAPPING

CANADIAN AERO SERVICE, LTD., OTTAWA, is our affiliate

AERO
SERVICE CORPORATION
PHILADELPHIA 20, PENNSYLVANIA
Oldest Flying Corporation in the World

What's Happening

AMONG WORLD OIL MEN

A. D. CUMMING has been appointed by the Public Service Commission as research petroleum geologist with the Petroleum and Natural Gas Branch of the Department of Mineral Resources in Canada.

Cumming will be carrying out research at the Geological Survey Laboratory in Regina.

Born in Glasgow, Scotland, in 1929, he graduated from Edinburgh University with a B.S. in geology in 1951 and took post-graduate studies in Sedimentary Petrology, receiving a Ph.D.

NEW YORK CHAPTER of **NOMADS** elected Norris L. Boulden, International General Electric Company, as president for 1954. Pictured above at the annual business meeting are (seated) Stewart D. Beckley, Beckley, Haltom & Hickman, new vice president; President Boulden; and Herb E. Maland, R. J. Eiche & Associates, Inc., new secretary. Standing: R. E. James, Security Engineering Division, Dresser Operations, Inc., new treasurer; Douglas L. Grill, Link-Belt Company, assistant sergeant-at-arms; Joe L. Comer, The William Powell Company, sergeant-at-arms; and Russ V. McIntire, Baker Oil Tools, Inc., outgoing president and new regent.

•

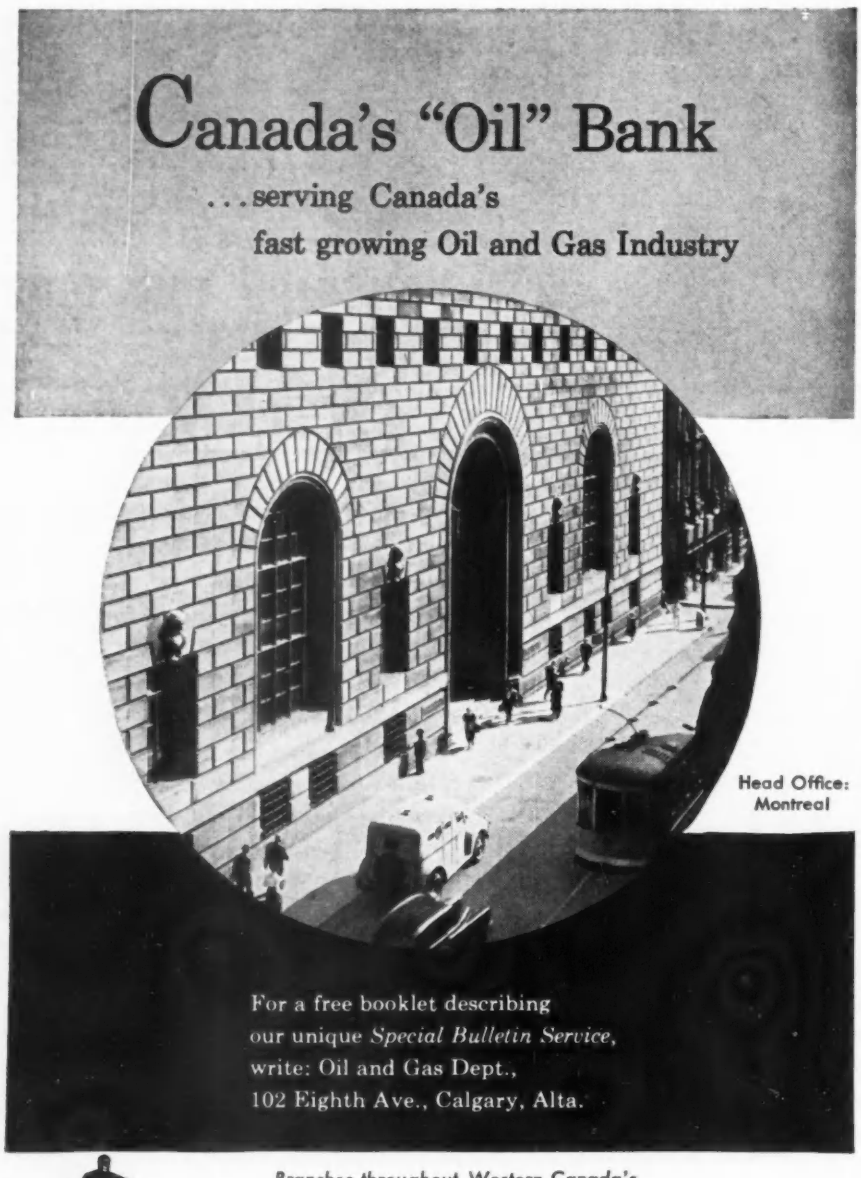
Southern California Petroleum Corporation has completed arrangements for transportation of all of the key American personnel who will head various departments in its Egyptian operation for the International Egyptian Oil Company.

SCOTT A. MURRAY has been in Cairo for three months, having been transferred from Southern California Petroleum Corporation's Midland, Texas, office, and is general manager for activities in this region.

FRANK LEWIS, former chief geologist for an independent oil company with offices in Midland, Texas, has moved to Cairo and is in charge of geology.

ROBERT FEI, formerly with a major oil company of California, was scheduled to leave for Cairo. Fei will take over the duties of general superintendent and will be in charge of all drilling activities in the Sinai Peninsula. His principal office will be in Cairo, athough field headquarters will be at El Shatt, four miles from Suez.

R. L. BREWER, head toolpusher, was scheduled to leave with Fei for Suez. Brewer has spent many years in the drilling end of the oil industry.



What's Happening

AMONG MEN IN THE INDUSTRY

Southern Production Company, Inc., has announced the appointment of **Dick T. Fenwick** as manager of the Production and Operations department of the company to fill the vacancy created by **Roy C. Williamson's** recent election to company president. Fenwick has been an employe of Southern Production since its organization in 1941 as a production engineer, superintendent, chief engineer, and manager of its natural gasoline and processing departments prior to his promotion to manager of production and operations.

Dick T. Fenwick

•

Vernon B. Zacher, formerly head of Technical and Research Department, Western Division, **Tide Water Associated Oil Company,** has resigned to enter private consulting practice, specializing in completion fluids, chemical usage and mud problems. Zacher will maintain his office and laboratory in Ventura, Calif.

•

Kerr-McGee Oil Industries, Inc., has named **W. C. (Demp) Womack** drilling superintendent of the Gulf Coast Division, with headquarters at Corpus Christi. Womack has been project manager of the firm's Alaskan operations, a post to which **Leo LeBron** has succeeded.

•

K. C. Heald, formerly director and vice president—production for Gulf Oil Corporation, has opened offices in Fort Worth as a petroleum consultant.

•

David L. Evans, petroleum engineer with Ohio Oil Company in Kansas, has resigned to become an oil and mining consultant at Wichita. He was with the firm of Powers and Evans before becoming an independent operator.

•

Seaboard Oil Company of Delaware, Mid-Continent Division, has named **H. C. McCarver** manager of the Geological and Geophysical departments, **J. M. Clayton,** coordinator of geology and geophysics; **Lamar McLennan,** chief geologist; and **J. E. Lawler** continues as chief geophysicist.

•

Stanley F. Davis, Jr., who has been with Phillips Petroleum Company for 11 years, has resigned to join **Texas Pacific Coal & Oil Company** at Fort Worth as engineer in charge of gasoline plants and natural gas operations.

•

Lion Oil Company has announced the addition of three new geologists and two landmen to the staff in the Rocky Mountain region. **William E. Vick,** formerly with Shamrock Oil and Gas Corporation, has been employed as a geologist attached to the district office in Bismarck, N. D. **Glen R. Horton,** formerly geologist for Lone Star Steel Company, Sinclair Oil and Gas Company and Tide Water Associated Oil Company, has joined the Denver district office of Lion Oil as geologist. **Lawrence G. Davis,** formerly with Sun Oil Company, has been added to the Lion Oil staff in Casper, Wyo., as geologist. **John D. (Jack) Irwin, Jr.,** landman at the Bismarck district office, has been transferred to Billings, Mont. **Thomas J. Moore,** landman, has been transferred from the Bismarck office to the Denver district office.

•

Joe B. Hudson, acting area geologist for Humble Oil & Refining Company, has been elected vice president of Monterey Oil Company in charge of exploration and production operations. Hudson began work with Humble in 1934 doing geological and geophysical work on the King Ranch in Texas, and later was loaned to Lago Petroleum Company for a special assignment in Maracaibo, Venezuela. He returned to Humble in 1937. In 1948 Hudson was moved to California in charge of the company's Geophysical department and in 1953 was named acting area geologist with jurisdiction over all geological and geophysical operations, land leasing and scouting on the West Coast.

•

George M. Dixon has returned to service with **Tide Water Associated Oil Company** and is assigned to the position of purchasing agent of the company's western division. Dixon succeeds **A. P. MacKillop,** who is retiring after completion of more than 44 years of service with the company. Dixon was granted a leave of absence by the oil company in April, 1950 to serve as manager of the San Francisco airport. He submitted his resignation as airport manager in order to return to service with Tide Water.

•

Warren Petroleum Corporation announces the promotion of **Floyd K. Newlin** to Gulf Coast regional superintendent, resulting from the oil division's expanded drilling and production activities. Newlin previously was a petroleum engineer for the corporation in the Gulf Coast area. The region over which Newlin will have supervision includes the Texas Gulf Coast and all of Louisiana. He will continue to make his headquarters in Houston. Newlin joined Warren in 1951 as a petroleum engineer after holding a similar position with Sunray Oil Corporation in South Texas.

Floyd K. Newlin

R. E. (Dolly) Davis has joined Farney Exploration Company Ltd. as vice president—geophysics. Davis entered the geophysical profession in 1935 with Stanolind Oil & Gas Company, remaning with the firm 10 years before joining Southern Geophysical Company of Fort Worth in 1945. He held the position of vice president in charge of the West Texas division for Southern until he resigned to join Farney Exploration in Calgary. H. E. Blatt of Wort Worth is also among the new members of the Interpretation department of Farney. Blatt has had experience in the Williston Basin, West Texas and Rocky Mountain areas.

R. E. Davis

•

Victor Horner has resigned from the Baroid Sales Division, National Lead Co., Tulsa, and has joined **Don Johnston Drilling Company,** of Oklahoma City and Denver, as secretary-treasurer.

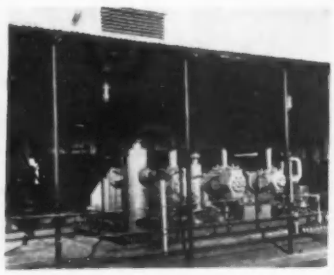
Horner graduated in 1935 from the University of Tulsa with a degree in petroleum engineering and joined The Carter Oil Company that year. He served with Carter for 10 years in several petroleum and drilling engineering capacities throughout the Mid-Continent and Rocky Mountain areas. Horner joined Baroid in 1946 and was serving as Division Field Service Engineer, Mid-Continent, when he resigned Feb. 1.

•

The Anschutz Drilling Company of Wichita has announced the appointment of **John W. McKnab** as manager of drilling operation in Kansas, Oklahoma, Colorado and Nebraska. Other operating officials are **E. G. Koelling,** secretary-treasurer, and **T. D. Sweetman,** drilling superintendent, with offices at Great Bend, Kansas.

•

Wm. Ross Cabeen & Associates, consulting petroleum geologists and engineers of North Hollywood, Calif., announce the opening of a new mining branch to be known as **Cabeen Associates Mining Company. Dr. Blakemore E. Thomas** will be chief geologist and will be in charge of the new organization to be headquartered at the North Hollywood office. Thomas received his doctorate in mining geology from California Institute of Technology and, for the past 2½ years, has been an associate with Wm. Ross Cabeen. Currently, Cabeen Associates Mining Company is leasing and doing consulting work in the uranium bearing Colorado Plateau area as well as in other Rocky Mountain states.

SECONDARY MODERN RECOVERY
TECHNICAL CONSULTING
PRODUCTION ENGINEERING
SERVICE, INCLUDING
CORE ANALYSIS
PRESSURE MAINTENANCE WITH GAS OR WATER
REPRESSURING WITH GAS OR WATER
Package Unit
for Gas Pressure
Maintenance
Strawn Sand

Archer County,
Texas
SURVEYS
ESTIMATES
DESIGN
INSTALLATION
SUPERVISION
PETROLEUM ENGINEERS
CABLE ENGINEERING
WICHITA FALLS, TEXAS

CUT STUCK
SAND LINES
IN THE
WELL

KINLEY
SAND LINE
CUTTER
M. M. Kinley Company Licensees
ABILENE, TEXAS
Hudson-Eads, Inc. - - - - - - - - - - 2-5331
CORPUS CHRISTI
Tubokut Wireline Services - - - - - - 5-1811
Tuboscope - - - - - - - - - - 4-3137, 2-1242
Wireline Specialties Co. - - - - - - - 3-2196
HOBBS
Horne Well Service Co. - - - - - - - - 3-5396
HOUSTON
Adair Service Co. - - - - WE-6497, PR-4652
Tuboscope - - - - - - - - JU-0577, MO-4279
MIDLAND
Luccous - - - - - - - - - - - 4-8471, 4-4320
NEW IBERIA
Tuboscope - - - - - - - - - - - 1411, 3210-W
OKLAHOMA CITY
Rainbo Service Co. - ME 4-2131, ME 4-4555
WICHITA FALLS
Hudson-Eads, Inc. - 2-3767, 2-8584, 3-4690

Frank A. Nice, Jr., has joined the staff of **Hurt Oil Co., Ltd.** in Houston as manager of drilling and production operations. Formerly he was associated with Texas Gulf Producing Company as petroleum engineer in both domestic and foreign operations. A native of Texas, Nice was graduated from Texas A & M College with a B.S. degree in petroleum engineering in 1942 and served with the armed forces until 1945.

Frank A. Nice, Jr.

•

William N. Tindell, assistant district geologist for **Mayfair Minerals, Inc.**, at Abilene, Texas, for several months, has been promoted to district geologist.

•

Chester H. Westfall has resigned as president and general manager of Mercury Drilling Company, Tulsa, and will operate as **Chester H. Westfall Drilling Company.** In a deal with Mercury, Westfall became sole owner of all drilling tools, equipment and drilling operations formerly controlled by Mercury. Office and drilling personnel will continue as under Mercury Drilling Company.

•

J. H. Todd has been selected manager of the Exploration department of **Standard Oil Company of Texas.** Other appointments include **L. F. Adams**, superintendent, Southern Exploration Division; **J. J. Pennington**, superintendent, offshore exploration district; and **L. W. Funkhouser**, superintendent, Southwest Louisiana Exploration District. **R. W. Stoneburner** continues as superintendent of the Southeast Louisiana District. The new offshore district will comprise the offshore area west of the South West Pass of the Mississippi River and Pennington's position will include the work formerly handled by Adams.

•

Standard Oil Company of Texas has transferred **J. P. Jones**, former district production superintendent at Snyder, Texas, to the position of division production superintendent for the Western division at Midland, Texas. **H. W. Mathews**, former division production superintendent at Midland, Texas, has been transferred to Houston, to fill the newly-created position in the Production department of manager —non-operated joint venture interests.

•

Archie H. J. Chadwick, Walnut Creek, Calif., has been promoted to assistant purchasing agent of Tide Water Associated Oil Company's Western Division. Chadwick succeeds Alfred Urry of San Francisco, who is retiring after more than 40 years of service with Tide Water.

•

Rex V. Lentz, formerly director of Special Services Department of the Mercantile National Bank, Dallas, has opened his own management consultant service, **Rex V. Lentz & Associates**, in Fidelity Union Life Building, Dallas. The new firm will offer specialized and confidential service to business organizations including oil companies.

George W. Atchley has been promoted to assistant district superintendent of **Republic Natural Gas Company's** Hugoton, Kansas, office. Atchley joined Republic in 1949 as engineer in the Dallas office, after receiving his degree in petroleum engineering from the University of Oklahoma. He worked as field engineer in the South Texas District and as district engineer in the Oklahoma District at Pauls Valley, Okla.

George Atchley

•

Consolidation of **Deep Rock Oil Corporation's** land and exploration division and production division under **Carl A. Houy**, vice president, has been announced. Houy previously headed the company's production division and is president of **Hugoton Plains Oil and Gas Company**, a Deep Rock subsidiary. Houy will continue to oversee all production activities and will head the exploration program which Deep Rock has scheduled for 1954.

•

Charles J. Hagerling, Oklahoma independent oil operator, has formed a partnership with **Thomas B. Craven**, formerly with Musgrove Petroleum Company at Ellsworth, Kansas.

•

William H. (Bill) McConnell, district geologist at Amarillo for **The Texas Company**, has resigned to become a consultant. He has been succeeded by **J. R. McMurry**, who has been in the Abilene district.

•

Wallace C. Thompson, vice president, **General Crude Oil Company**, was elected president of the company to fill the vacancy created by the recent death of Thomas W. Pew.

•

Richard P. Nixon, former geologist at Russell, Kansas, for Jones, Shelburne and Farmer, Inc., has resigned to become a consultant in Russell.

•

James D. Morris, former chief geologist for **Derby Oil Company**, has opened an office at Wichita, Kansas, as consultant.

•

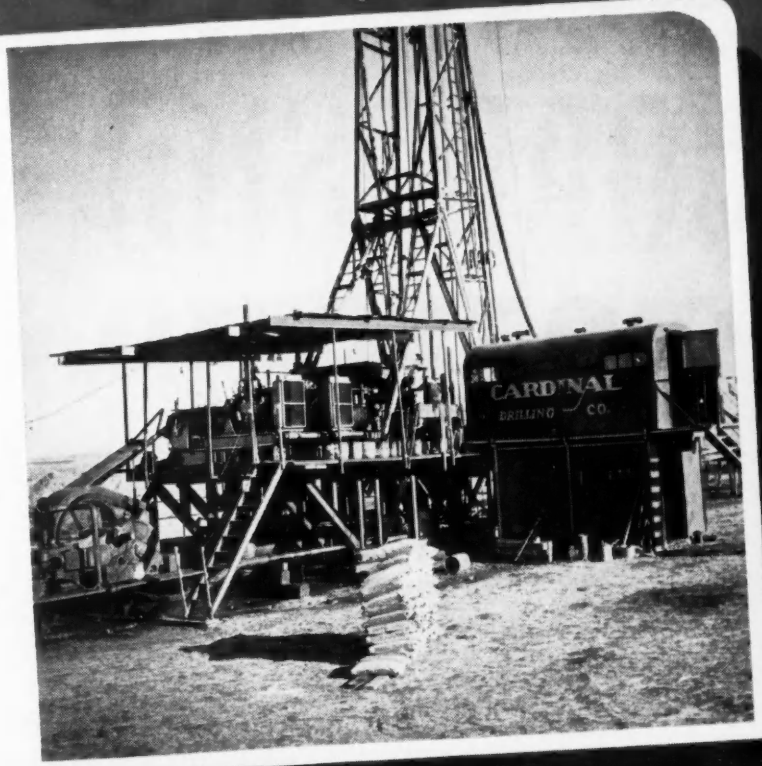
R. L. Adams, Ardmore, Okla., has been promoted to the newly-created position of assistant superintendent of **Continental Oil Company's** West Texas-New Mexico production division with headquarters at Midland, Texas. He formerly was South Oklahoma district superintendent at Ardmore. **Jack Marshall**, Big Spring, Texas, assistant superintendent of Conoco's West Texas production district, will succeed Adams as South Oklahoma district production superintendent at Ardmore. Adams joined Conoco in 1946 as a roustabout at Hobbs, N. M., serving as petroleum engineer at Hobbs and Big Spring before his promotion in 1948 to district petroleum engineer at Borger. He was named assistant district production superintendent at Wichita Falls in 1950 and two years later was promoted to South Oklahoma district superintendent. Marshall became associated with Conoco in 1949 at Ponca City, Okla., and was promoted to district petroleum engineer at Geneseo, Kansas. Later he transferred to Big Spring as West Texas district assistant superintendent.

GM DIESEL
CASE HISTORY No. 538-1Y

USER: Cardinal Drilling Company, Bismarck, N. D.

INSTALLATION: Two GM "Twin 6-71" Diesels replaced four gas engines in February 1953, driving PBM 36 Emsco drilling rig and mud pump.

PERFORMANCE: Drilling Superintendent Charles Spaulding reports he's cut fuel costs 49%, maintenance costs 25% and boosted production 25% since he switched from butane to GM Diesel power. GM Diesels also eliminated the problem of fuel freezing in the lines when drilling in 30° - 40° below zero weather.



It Pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL POWER

Drills Faster—Cut Fuel Costs 49%

Since He Switched from BUTANE to General Motors Diesel

Here's a new General Motors Diesel economy story: Although butane cost this drilling contractor about 5¢ less per gallon than Diesel fuel, he switched from an LP gas to General Motors 2-cycle Diesel power—*and cut fuel costs 49%!*

GM Diesels cut fuel consumption by 335 gallons per 24-hour day—boosted production 25%. Because GM Diesels are built for this kind of work, his maintenance costs dropped 25% in the first 8 months. He is also no longer bothered with fuel freezing in the lines.

Producing more power from smaller, lighter Diesel units, quick-starting GM 2-cycle Diesels let drillers make faster moves without special road permits. GM Diesel distributors back up engine performance with fast service and quick delivery of low-cost parts. As Drilling Superintendent Charles Spaulding says, "I'm usually drilling in pretty isolated territory but no matter where I drill, I'm close to GM Diesel service." For more information see your GM Diesel distributor or write:

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 PHILTOWER BLDG., TULSA, OKLAHOMA

ALABAMA—Montgomery 1
ALABAMA MACHINERY & SUPPLY CO.

CALIFORNIA—Bakersfield
LAWLESS BROTHERS

Berkeley
WEST COAST ENGINE & EQPT. CO.

Los Angeles 21
ANDERSON-O'BRIEN CO.

COLORADO—Denver 9
THE COLORADO BUILDERS' SUP. CO.

ILLINOIS—Centralia
WESTERN MACHINERY & ENGINE CO.

ILLINOIS—Mt. Carmel
WESTERN SERVICES

KANSAS—Wichita
DIESEL EQUIPMENT CO., INC.

LOUISIANA—Harvey
GEORGE ENGINE CO., INC.

Shreveport
UNITED TOOL CO.

MICHIGAN—Detroit 4
THE EARLE EQUIPMENT CO.

MISSOURI—St. Louis 10
WESTERN MACHINERY & ENGINE CO.

MONTANA—Billings
SEITZ MACHINERY CO., INC.

Missoula
MOUNTAIN TRACTOR CO.

NEW MEXICO—Albuquerque
THE HARRY CORNELIUS COMPANY

NORTH DAKOTA—Fargo
SWEENEY BROTHERS TRACTOR CO.

Williston
SWEENEY BROTHERS

OKLAHOMA—Oklahoma City
DIESEL POWER CO.

TEXAS—Brownsville—Corpus Christi—Dallas—Houston—Lubbock—McAllen (San Juan)—Odessa—Wichita Falls
STEWART & STEVENSON SERVICES, INC.

Plainview
DIESEL POWER, INC.

UTAH—Salt Lake City 4
CATE EQUIPMENT COMPANY

WYOMING—Casper
THE COLORADO BUILDERS' SUPPLY CO.

POSITIVE CORROSION PROTECTION

with HUMBLE

Protective Coatings

NON-DRYING TYPE — A wide range in consistency, from very thin to very thick. All afford excellent rust protection to steel surfaces, yet may be easily removed with any ordinary petroleum solvent.

HARD-DRYING TYPE — These coatings, when dry, form a thin hard uniform film over the surface. They are more than ordinary "paint" because they inhibit or prevent the growth of corrosion under the coating film.

Humble Protective Coatings include not only the well-known RUST-BANS but other special coatings which furnish protection for all kinds of surfaces under all kinds of uses.

HUMBLE

*Call on the Sales Technical Division of Humble Oil & Refining Co. for an analysis of your problem and expert advice. Written recommendations will be submitted without cost.

PROTECTIVE COATINGS

INCLUDING RUST-BAN

HUMBLE OIL & REFINING CO. • P. O. BOX 2180, HOUSTON, TEXAS

DEATHS

Col. Wilson G. Saville, geophysicist and former head of the Port Commission in Houston, died February 14 at his home in Houston. Saville was the senior partner in Gravity Meter Exploration Company with operations in most oil areas of the world. As geologist and engineer, Saville was is Bisbee, Ariz., with Phelps Dodge Copper Company for six months in 1920, then spent four years with Rycade Oil Corporation in Houston. He founded the Torsion Balance Exploration Company in 1935. Col. Saville was graduated from West Point in 1918 but retired from active military service in 1920 for a career as geologist and mining engineer.

•

Hunter W. Pryor, head of the tax department of the Arkansas Fuel Oil Corporation, died January 27 in Shreveport, La.

•

Dr. Homer J. Smith, 52, former professor of geology at the University of Tulsa, died January 14 in Bogota, Colombia. Smith, a member of the TU geology faculty from 1937 until 1943, has been manager of the land and exploration divisions of Socony-Vacuum Oil Company, Inc., in South America the last 10 years.

•

George I. Hegwood, 61, independent oil operator in Tulsa for 20 years, died January 27.

•

Joe T. Hines, 65, independent oil operator, died in Tulsa January 25.

•

Charles Nelson, Jr., retired secretary-treasurer of the old Oklahoma Pipe Line Company, died in an Oklahoma City hospital February 3. He retired from the company, now known as the Interstate Pipe Line Company, 12 years ago after approximately 30 years' service.

•

Richard G. Donnelly, former Tulsa resident, died at his home at Electra, Texas, February 3. He was a retired production department superintendent at The Texas Company.

•

John W. R. Crawford, landman and drilling adviser for the Parker Drilling Company of Tulsa, died February 8. He was a native of East Orange, N. J.

•

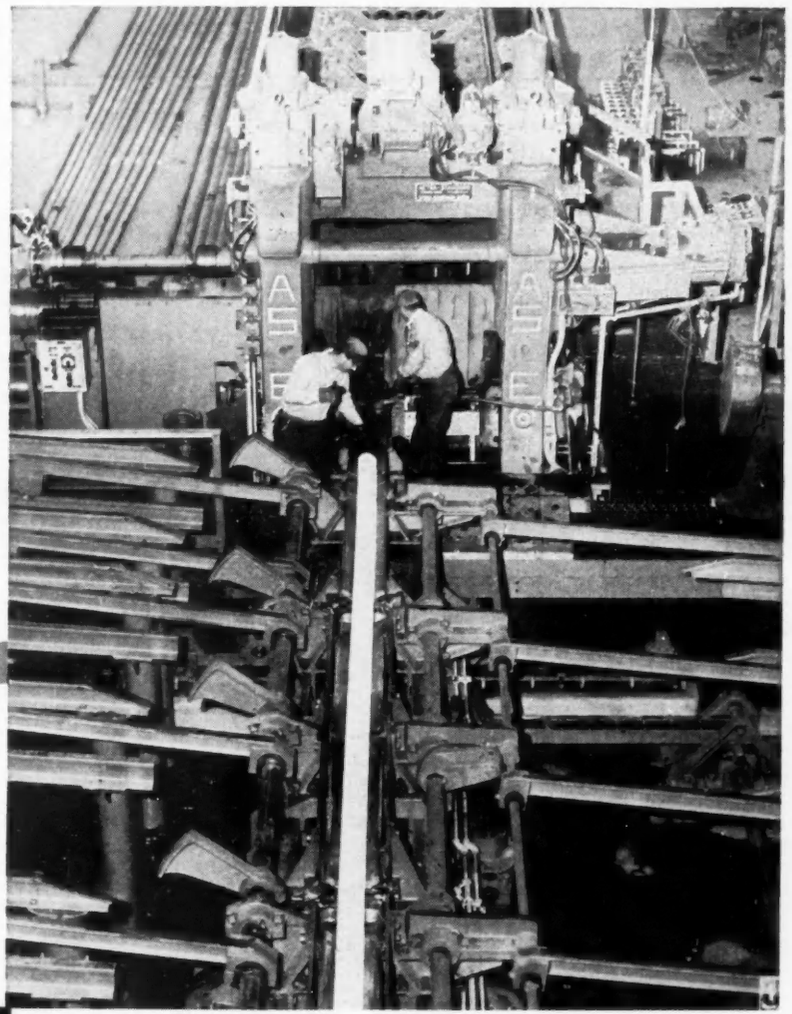
B. E. Walter, 80, of Tulsa, died February 8. He had been general superintendent for the late Homer Wilcox and the Producers and Refiners Oil Company before founding the B. E. Walter Oil and Gas Company in the 1930's. He had been retired eight years.

•

Huntington B. Henry, 67, Chicago oilman and investment banker who resided in Tulsa and Bartlesville during early oil boom days, died January 26 in a Chicago hospital. Henry entered the oil business in 1908, associated with his father as vice president of the Henry Oil Company.

•

Nathaniel Green Guiberson, Dallas industrialist and one of the brothers who formed the Guiberson Brothers firm, forerunner of The Guiberson Corporation, died at his home February 15.



"rolling along"

AT THE CF&I SEAMLESS TUBE MILL

In efficiency and high output, this plug rolling mill is typical of the modern equipment used throughout every stage of production at the new C F & I Seamless Tube Mill in Pueblo, Colorado.

Here, rough tubes from the piercing mill are lengthened as their walls and diameters are reduced to the wall thickness required.

To the oil and gas industries of the West and Southwest, these up-to-the-minute facilities of the modern C F & I Seamless Tube Mill are definite assurance of better service . . . bringing them convenient and dependable supplies of seamless tubing and casing of the highest quality.

C F & I Seamless Oil Country Tubing and Casing meet API STD 5A specification and are available in sizes from 2⅜" O.D. through 9⅝" O.D.

CF&I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

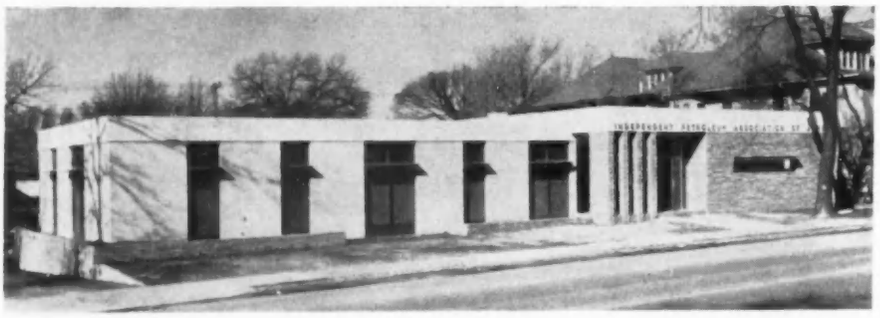
DENVER, COLORADO

CF&I

2217

What's Happening

AMONG INDUSTRY ASSOCIATIONS



IPAA Moves To New Building

National headquarters of the Independent Petroleum Association of America are now in this modern office building located at 1430 South Boulder Avenue, Tulsa. The building will be officially dedicated in October when the annual IPAA membership meeting is held in Tulsa. Tulsa officers and staff personnel have moved into the new headquarters.

API Production Division Plans Meeting in Houston

The Division of Production of the API, Southwestern District, will open its three-day spring meeting at the Rice Hotel, Houston, March 3.

The program for the general session March 4 includes an address by John G. Pew, vice president for production, API; an address by Lt. Gen. Jimmy Doolittle, vice president, Shell Oil Company, New York; and a talk by Hugh Roy Cullen, president of Quintana Petroleum Corporation, Houston.

Group sessions will be held March 4 and 5. Election of officers will take place at the group session March 5.

Geophysical Society Organized in Louisiana

The Southeastern Geophysical Society was recently organized in New Orleans, La., with E. H. Shannon of The Texas Company as president.

Other officers are D. D. Utterback, Freeport Sulphur Company, vice president; Merrill Smith, The Texas Company, secretary-treasurer; and B. H. Treybig, Jr., Louisiana Oil Exploration Company, district representative. Treybig lives at New Iberia; other officers are from New Orleans.

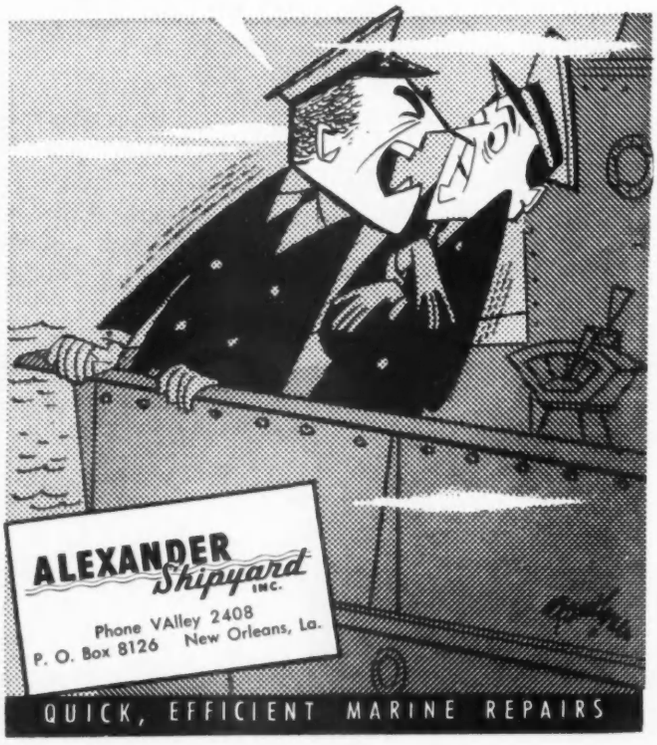
Membership in the society numbers 91.

LP Gas Association To Meet in Chicago

Open forums on industry problems and a trade show will attract an estimated attendance of 3300 industry representatives to the 1954 annual convention of the Liquefied Petroleum Gas Association in Chicago May 9-13.

Among the speakers will be Sheldon Coleman, president of The Coleman Company, Wichita, Kansas, and president of the Gas Appliance Manufacturers Association.

WHO'S JUMPY?
I MERELY ASKED HOW FAR IS
ALEXANDER SHIPYARD!



Why Drill a Dry Hole?

PROVEN GEOPHYSICS

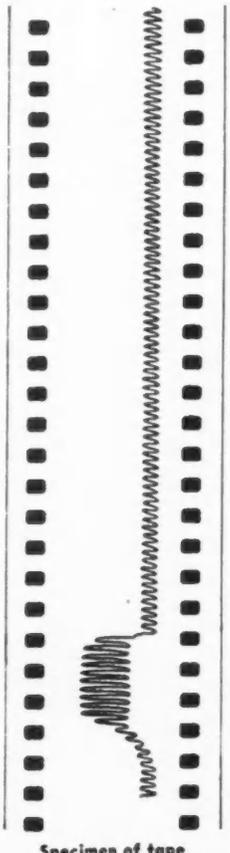
The Amazing Attractometer

The latest and most modern method of geophysical exploration that shortens the route to petroleum reserves by rigid instrumental recordings, indicating the existence or not of hydrocarbon accumulations, the approximate depth and quantity underlying the tested area; ten locations for a major oil company without error. Surveys conducted on acreage basis for cash fee and chance to earn small override, oil payment, leases or other interest, where saturation is indicated in commercial quantities. Full information on request.

To establish conclusive proof of the accuracy of our geophysical work, we will test and record on tape bearing your signature one or more wildcat locations in advance of drilling, indicating the existence or not of petroleum in commercial quantities underlying the tested areas and at what depth it may be found.

GEOPHYSICAL SURVEY SYNDICATE

4133 Sunnyslope,
Sherman Oaks, Calif.
Phone STate 46903



Specimen of tape indicating saturation

Exploration Geophysicists 1954 Officers Announced

Results of the mail ballot election of 1954-1955 officers of the Society of Exploration Geophysicists have been announced. Paul L. Lyons, Tulsa, exploration manager of Anchor Petroleum Company, was elected president; Roy F. Bennett, Oklahoma City, chief geophysicist of Sohio Petroleum Company, vice president; and Hugh M. Thralls, Tulsa, vice president of Seismograph Service Corporation, is the new secretary-treasurer.

Terms of office will begin April 16 at the close of the society's annual meeting in St. Louis. Dr. Milton B. Dobrin, Magnolia Petroleum Company, Dallas, continues in the two-year term as editor with Roy L. Lay, The Texas Company, serving as past president to complete the 1954-55 executive committee.

Haggin Joins IPAA In Rocky Mountain Area

John T. Haggin has joined the Independent Petroleum Association of America to fill a newly-created post as district representative for the Rocky Mountain area.

Haggin will be liaison representative for IPAA throughout the Rocky Mountain area, working directly with its membership on industry matters. His territory will include Northern New Mexico, Colorado, Wyoming, Montana, Nebraska, Utah, Idaho and North and South Dakota.

Day Named President Of Petroleum Club

David E. Day, vice president in charge of manufacturing and pipe line, Richfield Oil Corporation, has been elected president of the Petroleum Club of Los Angeles. Wendell M. Jones, vice president and general manager, Bethlehem Supply Company of California, was elected vice president.

Drilling Contractors Plan Research Program

The American Association of Oilwell Drilling Contractors has approved a research program designed to find ways to increase the rate of penetration in oil and gas drilling operations.

Special emphasis will be placed on a study of drilling fluids and their effect on drilling efficiency under all conditions.

The association voted $30,000 for carrying on research work during the first year. Preliminary arrangements have been made with Battelle Memorial Institute of Columbus, Ohio, for conducting the program.

Oil and Gas Group Honors President of Turkey

In honor of His Excellency Celal Bayar, president of the Republic of Turkey, the board of directors of Western Oil and Gas Association held a formal dinner recently in Los Angeles.

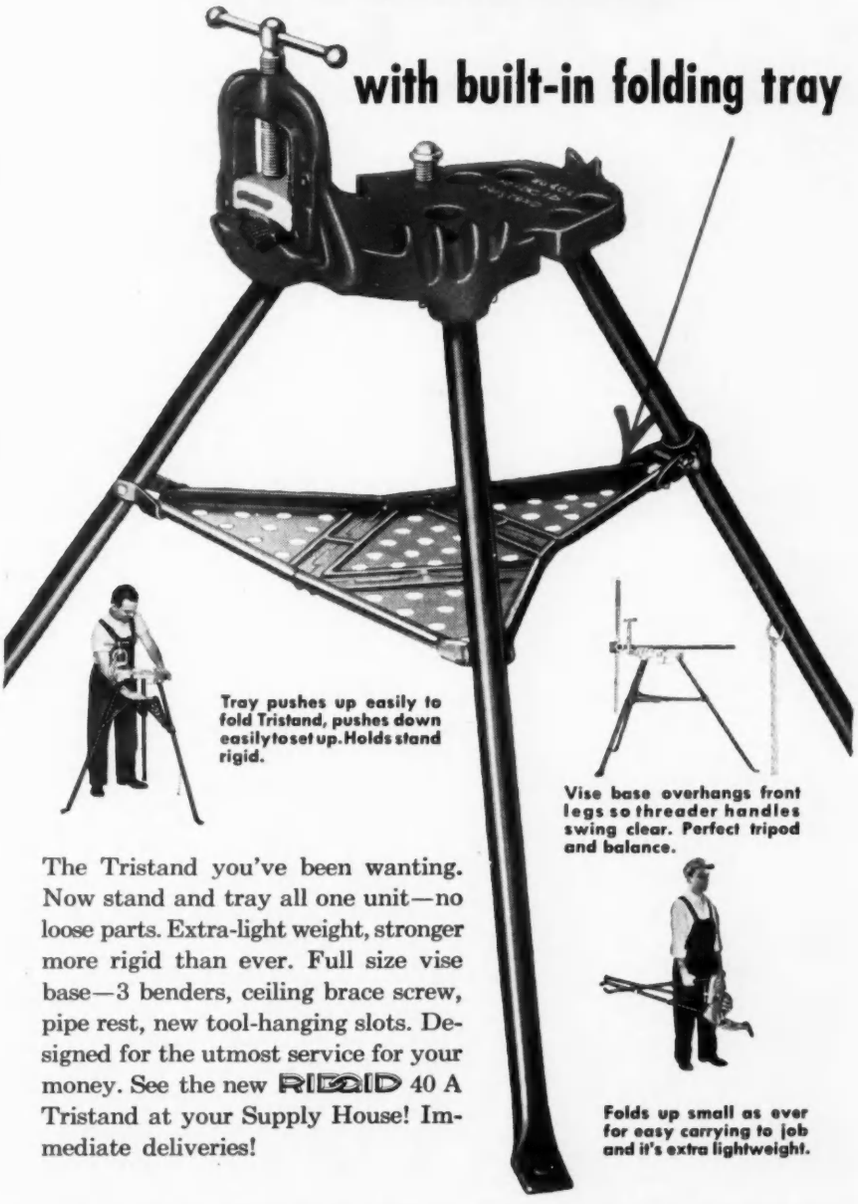
Guest speaker was former ECA director, Paul Hoffman, chairman of the board of the Studebaker Corporation. Wallace E. Sterling, president of the University of Stanford, was toastmaster.

Look...the New 40A

RIDGID

Tristand

with built-in folding tray



Tray pushes up easily to fold Tristand, pushes down easily to set up. Holds stand rigid.

Vise base overhangs front legs so threader handles swing clear. Perfect tripod and balance.

The Tristand you've been wanting. Now stand and tray all one unit—no loose parts. Extra-light weight, stronger more rigid than ever. Full size vise base—3 benders, ceiling brace screw, pipe rest, new tool-hanging slots. Designed for the utmost service for your money. See the new RIDGID 40 A Tristand at your Supply House! Immediate deliveries!

Folds up small as ever for easy carrying to job and it's extra lightweight.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

RIDGID

Work-Saver Pipe Tools

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

What's Happening

AMONG SERVICE AND SUPPLY MEN

Baash-Ross Plans Sales Activities

Baash-Ross representatives in the Gulf Coast area gathered recently in Houston to plan 1954 sales activities and to hear an address by Ken Mehrens, purchasing agent for Superior Oil Company. Shown in the front row, left to right, are C. M. Laudermilk, Glenn Huckabay, "Zeke" Browning, "Ink" Wotkyns and Ken Jones. In the back row, left to right, are Albert Schoettler, Bob Brenner, Fred Frederick, guest speaker Ken Mehrens, Cecil Laws and George Cook.

Bovaird Employes Receive Service Awards

At the annual sales meeting of the Bovaird Supply Company, six employes received service awards from Davis D. Bovaird, president. Left to right are Bovaird, R. W. Robbins, 25 years; F. J. Robbins, 25 years; E. R. Chastain, 20 years; Mrs. Jewell Myer, 15 years; C. E. Pearson, 15 years; and J. E. Goodell, 15 years. They received wrist watches, coffee services, or clock radios.

Welex Advances Avent To Operations Manager

O. B. Avent, former Ardmore, Okla., district manager for Welex Jet Services, Inc., has been promoted to the position of operations manager of Welex with headquarters at Fort Worth.

His promotion caps 20 years of experience in the oil business, 13 of which have been spent with Welex and Lane-Wells Co., and seven years with other industry firms such as Pacific Pump, Western Acid and Oil Well Supply Company.

U. S. Steel's Oil Well Supply Lists Personnel Changes

Heading the list of recent personnel changes for U. S. Steel's Oil Well Supply Division, was the promotion of Jon S. Blyth to assistant manager of the eastern area.

Blyth moves to area headquarters at Columbus, Ohio. He has been manager of the area sales office at Pittsburgh since he joined "Oilwell" in May, 1943.

A. R. Nutter, office manager for the area offices here, was named to succeed Blyth at Pittsburgh and G. A. Yount of the area office staff was promoted to the post of area office manager.

Nutter is a veteran of almost a quarter of a century with "Oilwell" starting in 1929 as a salesman at Charleston, W. Va. He subsequently served as district manager at Mt. Pleasant, Mich. and Olney, Ill. before his appointment as area office manager.

Yount was employed by "Oilwell" in December, 1945 at Clay City, Ill. He served at various locations in Illinois and Indiana before transferring to the Columbus offices.

James E. Goff has been named field representative at Salem, Ill. He was manager of "Oilwell's" branch store at Centralia, Ill. He joined the division in 1938.

James E. McCaffrey, field representative, has transferred from Pikesville, Ky. to Parkersburg, W. Va. He was employed by "Oilwell" in March, 1943 and since that date has held sales and managerial positions in the eastern area.

HOMCO Designates Hal Roach Rocky Mountain Area Manager

C. L. Hal Roach has been designated area manager of the Rocky Mountain area for the Houston Oil Field Material Company, Inc.

Roach, a long-time employe of HOMCO, has been in the Sales department, but under the new appointment, he will be in charge of services also.

Roach's headquarters will be in Denver.

Jorgensen To Open Tulsa Steel Warehouse

The Earle M. Jorgensen Co. has announced the opening of a new warehouse and sales office in Tulsa.

This new warehouse and plant will be under the management of D. E. Rodricks, who has been named Tulsa district manager for Jorgensen Steel Co. Formerly assistant district manager of the Oakland, Calif. office, Rodricks has been with the Jorgensen Company since 1934, when he started as a warehouseman.

This newest link in the chain of Jorgensen warehouses in the major manufacturing centers throughout the western and southwestern states is located on a nine acre site in the Frisco Railway's new Tulsa industrial trackage area.

Sheppard Retires As Traffic Director From Hercules Powder Company

Morris W. Sheppard, an executive of Hercules Powder Company since it was founded in 1913 and director of the company's Traffic department since 1920, retired March 1.

Sheppard, a native of Wilmington, became associated with the Dupont Company in 1908 as a member of the traffic department, joining the newly-organized Hercules Powder Company five years later as assistant traffic manager.

He was named traffic manager in February, 1920. The title was changed to director of traffic in 1945.

Fluor Corporation Advances Kneubuhl to V. P. - Eastern Sales

James P. Kneubuhl has been appointed to the newly-created post of vice president-eastern area sales. Kneubuhl will remain in New York City where he has acted in the capacity of New York district sales manager for Fluor for three years.

He has been associated with Fluor for the past 13 years and during that time has served in the capacities of project engineer, district sales engineer and advertising manager.

H. T. Lorne has been appointed New York district sales manager to succeed Kneubuhl.

Brown Oil Tools Exhibits At University of Houston

Brown Oil Tools, Inc. was among the twelve service and equipment firms exhibiting at a symposium or permanent well completions sponsored by the University of Houston Engineering Department. Brown displayed their four types of retrievable, full opening packers used in permanent well completion.

Attending the Brown booth were P. B. Loper, Raymond Hoyle, C. C. Brown, Joe Brown, John Feeser, C. L. Parrott, Bob Evans, and J. B. Nelson.

Fort Worth Personnel Receive Awards From Mid-Continent Supply Company

Sixty-three Fort Worth employes of Mid-Continent Supply Company received gold and diamond service awards recently.

The presentation marked the beginning of the oil field supply firm's service award program. Eligible employes in locations outside the Fort Worth headquarters received their awards in ceremonies to be held in all areas of Mid-Continent operations.

Individually honored was Vice President J. C. Halbert who received a five-diamond award for 25 years' service.

The gold awards, designed in the shape of Mid-Continent's world-and-derrick emblem, are set with one diamond for each five years of service.

Twenty-year service awards went to Davis, Thornbury, Assistant Secretary Jennie Hereford, and Director of Credits Frank John. Receiving 15 years service awards were N. E. Barber, W. J. Bierman, T. M. Cone, R. M. Flippo. H. W. Fuller, M. F. Heet, C. D. Helm, P. Z. Hilliard, R. O. Moore, H. E. Quinn, C. A. Sanders, B. C. Stewart, and T. P. Tarwater. Ten-year awards were presented to Thurman Cline, M. F. Cribbs, Connie Housman, G. W. Jackson, J. C. McSpadden, H. D. Powell, B. H. Smyth, and W. E. Trammell.

Johnston Testers, Inc., Winds Up Sales Talks

Last of series of sales meetings for Johnston Testers was held in Los Angeles. T. M. Johnston, executive vice president, and J. E. Smith, vice president—Sales conducted the meetings which were held in Houston, Midland, Wichita, Casper and Los Angeles. Attending the Los Angeles meeting, left to right, were Dave Crockett, Charles White. John Flanagan, Dick Stanier, Cecil Weaver, Homer Hollingsworth, J. E. Smith, M. O. Johnston, chairman of the board and president, T. M. Johnston, W. F. Bettis, vice president—West Coast Operations, Bud Johnston, Parker Glass, E. T. Scott, Meryle Sutliff, Warren Johnston, Harold Masters and Richard Henderson.

Magcobar Begins Sales Training Program

The first phase of a sales training program that will eventually be offered to all Magcobar field service engineers was recently completed in Houston's Lamar Hotel. Frank Carson, personnel director, and Joe Webster, assistant general sales manager, are conducting the meetings. Division managers and other Magnet Cove officials who attended the first meeting are, left to right, front row: Jim McLaurin, New Orleans; K. L. Byerly, Houston; Carson; Willard M. Johnson, president of Magcobar; George Moore, general sales manager; Webster; Frank Loe, executive assistant to the president. Back row, left to right: Ed Lancaster, assistant general sales manager for engineering; Sid Lindley, sales manager for Permian mud service, Hobbs, N. M.; Hugh Munn, president, Permian mud service, Midland, Texas; Ed Taulbee, Olney, Ill. Wally Fraser, Denver; Fred Parker, Calgary; and Murray Moffatt, Fort Worth.

Kimray, Inc., Announces New Distribution Points

Kimray, Inc., Oklahoma City, manufacturer of gas regulators and liquid level controllers announces the following new distribution and service points: Merla Tool Corporation at Shreveport, La., and Clif Mock Company at Beaumont, Texas and New Ibera, La. Randall W. Larkin is manager of Merla Tool.

Rockwell Names Mankin To Key Engineering Post

Paul A. Mankin has been named chief engineer of the Pittsburgh Equitable Meter Division of the Rockwell Manufacturing Company.

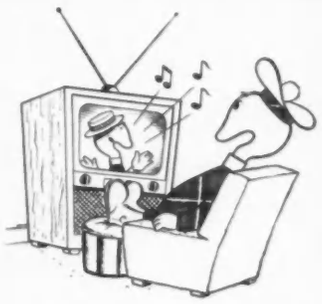
Mankin, a former vice president of Bowser, Inc., will assume charge of Rockwell's petroleum and industrial meter development program and will also direct the engineering of the Drill Unit Division. Mankin's headquarters will be at the Homewood plant.

Mankin began his professional career as a sales engineer for Sears, Roebuck and Company immediately after his 1939 graduation from Purdue University as a mechanical engineer. Before joining Bowser, he spent about two years as plant engineer at General Electric's plant at Fort Wayne, Ind., and later four years as a consulting engineer in that city.

Stewart & Stevenson Names Grant Truck Body Head

A. B. (Dick) Grant has been named head of the truck body division of Stewart & Stevenson Services.

He has been employed by Stewart & Stevenson for the past nine years. He was formerly in charge of quality control and inspection of technical work on the generator set program which Stewart & Stevenson has been developing for the U. S. government. Before joining Stewart & Stevenson Services, Grant worked for Goodyear Tire and Rubber Company for seven years.



"It all 'filters' down to—a Better Block for EVERY purpose."

McKISSICK

SAFETY TUBING BLOCK

The BEST in the field

Permanent safety assured by non-detachable guards which are never removed.

Heavy Universal ball thrust bearing combined with the convenient McKissick latch type becket constitutes an extremely short, sensitive combination for tubing operations.

McKISSICK

McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

Kerotest Advances Coe To Valve Sales Manager

Russell H. Coe has been appointed sales manager for Steel Valve Sales, Kerotest Manufacturing Company.

Russell H. Coe

Coe has been associated with the pipe line supply business for over 25 years. Starting with Youngstown Sheet and Tube Company in 1929 as a test engineer, he progressed to sales engineer two years later. In 1939 Mr. Coe joined Pipe Line Service Corporation as a sales engineer. In 1945 he was made a vice president of the firm. In 1953 he joined Kerotest as sales representative.

Hayden Hughes Appointed Executive in Two Companies

Hayden Hughes has been appointed to an executive position in both Manning & Nance, Inc. and M & R Specialty Company.

Hayden Hughes

Hughes, who has had wide experience in the field of petroleum, is a graduate of the University of Oklahoma. He was employed by Phillips Petroleum Co. in 1933 as a petroleum engineer and worked up to the position of chief petroleum engineer in 1940. During World War II he was assistant chief mechanical engineer with the Phillips Defense Plant Division, working on the design, construction, and operation of a butadiene plant.

In 1953 he became assistant general manager of International Petroleum (Colombiana) Ltd., and a director of Esso Colombiana and Colombiana de Gas. This position he held until his resignation.

Stardrill-Keystone Appoints Jackson-Markus Distributor

Jackson-Markus Supply Co., Los Angeles, has been appointed exclusive distributor in the southwestern United States and northern Mexico for Stardrill-Keystone Company and its subsidiary, Acme Fishing Tool Company.

Ivan E. Wild, a "Star" man for the past 41 years, has been transferred to Los Angeles from the southeastern territory. He will headquarter at Jackson-Markus and will be in charge of that company's Well Drilling Division. George A. McGrew is now Stardrill's western sales manager for all the manufacturer's products.

International Harvester Opens Lubbock Truck Sales Office

The International Harvester Company opened a new motor truck district sales office in Lubbock March 1. The office will be located in a suite of rooms in the Stanolind Building.

The new sales facility would serve the approximately 125 International motor

truck dealers and four company-owned International motor truck sales branches located in west Texas, eastern New Mexico, and the most south-westernly portion of Oklahoma.

The opening of Harvester's district sales office will mark the second company operation to be established in Chicago. An International motor truck retail sales branch was opened there in January, 1952.

Petroleum Industry Supply Formed To Distribute H. C. Smith Products

Petroleum Industry Supply Co., Inc., new supply company headed by Ray Poole, president and general manager, has been formed to be exclusive distributor of H. C. Smith rock bits and hole openers throughout Peru, Bolivia, Chile, Brazil and Ecuador.

Ray Poole

Associated with Poole is Ing. Manuel Carrera V., vice president and northern division manager. The supply company's headquarters will be located in Lima, Peru, and branches will be maintained in Piura and Paita, Peru.

Darling Valve Appoints Engstrom Sales Manager

Bertil E. Engstrom has been named Midwest Regional sales manager at The Darling Valve & Manufacturing Co.

Engstrom joins Darling Valve after six years with Minneapolis-Honeywell where he served as assistant sales manager, and more recently as regional sales manager. He attended the University of Wisconsin, Illinois Technical Institute, and the Duluth Business University.

Born in Sweden, Engstrom will head Darling Valve sales in roughly a dozen states extending from east Ohio border to the west border of the Dakotas, to the south border of Kentucky.

TOTCO Sends Williams On Overseas Trip

E. E. (Bill) Williams, export representative for Technical Oil Tool Corporation, has just left for an extended trip to overseas oil countries. According to H. H. Peters, president of Totco, Williams will stop in New York and then visit Venezuela for two months. After returning he will proceed to Europe, then to the Near East, and finally to the Far East.

E. E. Williams

Williams will be representing both Totco and the Lucey Export Corporation, and will contact users of Totco Recorders and other products in Lucey's line, for the purpose of education and service.

European Geophysical Company Opens in Paris Headquarters

Formation of Societe Exploration Geophysique Rogers, a new geophysical company, has been announced by Sam D. Rogers, president of Rogers Geophysical Company. The new company will have headquarters in Paris.

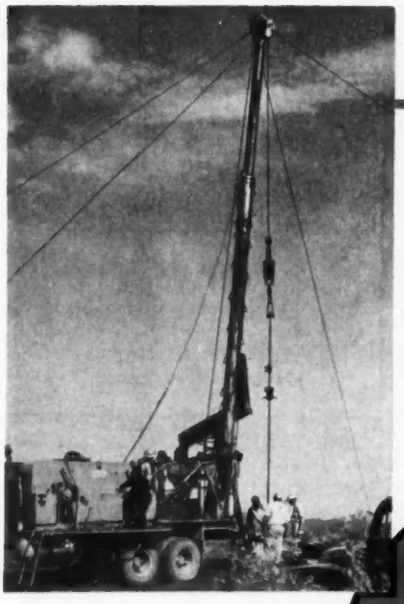
Robert du Pasquier is manager and will be in charge of all European operations for the new company. In addition to Rogers, owners are J. B. Nichols and J. R. Monkhouse of Houston and William M. Krum of Caracas. It is planned to add instrument assembling to the European operations at a later date.

Broderick & Bascom Expand Houston Factory

To meet increased demand for wire rope in the South and Southwest, Broderick & Bascom Rope Company has constructed a new addition to the Houston plant.

The original Houston factory was constructed in 1950. Increasing activity in the oil and gas, construction, industrial and marine fields has created demands that necessitated construction of the new plant facilities.

The Broderick & Bascom expansion will provide additional warehousing facilities as well as a multi-purpose shipping department with modern docks and equipment.



STOP CORROSION

REDUCE EXPENSIVE WORKOVER OPERATIONS

NOCOR
CORROSION INHIBITOR

NOCOR 102
CORROSION INHIBITOR

In one highly corrosive field, Nocor "102" cut corrosion expense to the cost of inhibitor alone. No failure attributable to corrosion has occurred in the 11 months since Nocor "102" treatment was begun.

In another highly corrosive field, Nocor cut corrosion costs to *.651 cents* per barrel of oil produced, as compared with *17.81 cents* before Nocor was used. Overall lifting costs in this field are now the lowest in history.

Let Nocor help reduce your workover problems.

Write today for the free 12-page illustrated booklet which shows how *Nocor is cutting the costs of corrosion in producing wells everywhere!*

CARDINAL CHEMICAL · INC.

HOME OFFICE ODESSA · TEXAS BOX 2049

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

WORLD OIL'S Trading Post
CLASSIFIED ADVERTISING

RATES: Regular Classified (undisplayed) **set in this size type: 12 cents per word. Minimum charge, $3.** Blind box address in our care counts six words. Replies forwarded without charge. **Situation wanted** ads, 6 cents per word. **Display ads, set in suitably larger type with ruled border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. All classified ads payable in advance. COPY DEADLINE:** 5th of month preceding date of issue. Send copy and checks to: **Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.**

SITUATIONS WANTED

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

Salesman with 14 years experience selling power units and pumps, engineering background, now working West Texas and New Mexico, seeks connection with supply house or manufacturer who needs a representative in this area. Address replies to Box 17-W, WORLD OIL, Houston 1, Texas.

■ EQUIPMENT SALES ENGINEER with 15 yrs. of very successful supervisory experience in manufacturing, construction and petroleum industries wants to sell two or three lines. Prefer small drawing account first few months, then straight commission. La., Southern Miss. and Ala. Write Box 18-W, c/o World Oil, Houston, Texas.

■ Man thoroughly experienced in oil field office accounting procedure, production records, Railroad Commission reports, payrolls, material & supply records and field inventories. Desires position in any of above categories or as assistant chief or chief clerk. Experienced also in Production Control in manufacturing plant manufacturing oil field equipment, will consider offer in this field. Box 19-W, c/o World Oil, Houston, Texas.

Engineer, Chief — Plant — Maintenance — Operating: Graduate, several years heavy experience. Thoroughly capable steam and electrical generators and distributors. Refrigerators and air-conditioning, etc. Installation and maintenance of all types and sizes of refrigerators and air-conditioning from the smallest household to largest process and office building. Go most anywhere—domestic or foreign. State location, salary range, etc. Box 92-W, c/o World Oil, Houston, Texas.

WANTED IN CANADA

Experienced manufacturer representative in Canada desires additional accounts. Manufacturers now represented include Gray Tool Company and Ventura Tool Company. Best of references.

Leidecker Tool Co. Ltd.
6921 104th Street
Edmonton, Alberta, Canada. Phone 35016

DECALS

■ TRUCK LETTERING AND TRADEMARK decals made for your trucks. Easy to apply, uniform, distinctive, economical for small or large needs. Write for Catalog. Mathews Company, 827 S. Harvey, Oak Park, Ill.

LAND FOR SALE

■ PROSPECTIVE OIL LANDS FOR SALE! 1100 acres undivided interest in 22,000 acres Atchafalaya Basin, South Louisiana, swamplands. Now leased, mostly $10 rentals, 1/6th royalty. Valued at $80,000. Good long term investment. W. K. Smith, Box 272, Franklin, La.

EQUIPMENT WANTED

WANTED TO BUY

Used 16" OD Plain End Line Pipe

CENTRAL PIPE & SUPPLY CO.
Phone 47404—Box 1466, Lubbock, Texas

FOR SALE

■ FOR SALE: SPEED STAR SPUDDERS. No. 83 Semi Trailer Star Spudder with goose neck bracket for transportation, $9000.00. No. 71-A Speed Star for truck mounting, $3500.00. Both machines in good running condition. Available immediately f.o.b. New Mexico. Can furnish used tools and lines with either machine if desired at additional price. JACKSON MARKUS SUPPLY CO. 3612 E. 26th St., Los Angeles 23, Calif. Cable & Rotary Equip.—Bought-Sold-Rented.

EQUIPMENT FOR SALE

1—7¼ x 12 Emsco Power Pump.
1—6 x 16 Wilson-Snyder Power Pump.
1—7 x 12 Wilson-Snyder Power Pump.
1—4 x 6 Wilson-Snyder Power Pump.
2—20" Oil Well Steam Pumps, one with steel end.
1—20" Wilson-Snyder Steam Pump.

All above pumps in A-1 condition, located in Houston, Texas. Call McCandless, office phone CEntral 7301, home phone, MElrose 6764 or post office box 2112.

■ **DOODLEBUGGING — DOWSING — DIVINING.** A scientific and unprejudiced analysis of the influence of electromagnetic fields on psychic phenomena, with particular attention to divining (doodlebugging). **PSYCHICAL PHYSICS** by S. W. Tromp, Professor of Geology, Fouad I University, Cairo (Egypt), is a 534 page volume (153 illust.) in which the author analyzes all existing knowledge of divining phenomena. Oil operators will find this book thought provoking. Only 250 copies left. Write now for yours. Price $8.00. ELSEVIER PRESS, 402 Lovett Boulevard, Houston 6, Texas.

For Sale
Complete Compressor Station

Two 600 H.P. Type L.V.G. Ingersoll-Rand gas engines with high pressure compressors. Engines and compressors complete including Parkersburg Building. Located twenty miles from Houston. Contact Petroleum Management Company, 565 San Jacinto Building, Houston, Texas. Phone: CHarter 4781.

HELP WANTED

Seismologist

Major oil company needs experienced record interpreter with minimum of 2½ years seismograph experience and 6 months record picking. Our employees know of this ad. Box 16-w, c/o World Oil, Houston, Texas.

■ Sales Manager for oil well equipment business, having engineering education, 10 to 15 years experience in sales and supervisory capacities and having major oil company contacts. Age 35-45. Substantial salary and commission. Submit detailed resume of qualifications to Box 15-W, World Oil, Houston 1, Texas.

BUSINESS OPPORTUNITIES

■ See A. L. Bowles, Ada, Okla., for Oil Investments, drilling deals. Can also use a large producing lease. Must have all data.

Caterpillar Names Darr Dealer in Dallas Area

H. S. Darr, Arizona businessman, has been named dealer for Caterpillar Tractor Company in the territory of Dallas.

Plans have been announced for a new building to be completed in the near future on an 18-acre tract located at Irving, Tex. The new building will have approximately 50,000 square feet of floor space. Until these plans can be completed, temporary headquarters will be taken up at the same location previously occupied by the R. E. George Equipment Company.

Lee White has been named general service manager of the organization.

Foster Cathead Moves Offices Near Wichita Falls Plant

The Foster Cathead Company has announced moving its downtown offices to a new building at 2101 Grant Street, Wichita Falls, Texas, where the plant is also located.

Rockwell Announces Contest On Planned Meter Retirement

Rockwell Manufacturing Company has announced sponsorship of a nation-wide contest for persons employed in the gas industry on the general subject of planned meter retirement programs in the industry.

More than $5000 in prize values, consisting of Delta power tools, will be awarded to winners in two categories. The first category will be for an essay not exceeding 2000 words in length on the subject "The Economics of a Planned Meter Retirement Program." The second category will consist of filling in the last line of a jingle.

Only those persons employed by gas utilities or those associated with gas utilities as consultants are eligible to participate. The contest closes at midnight, April 30, 1954. Further information may be obtained by writing Rockwell Manufacturing Company, Gas Meter Contest, 400 North Lexington Ave., Pittsburgh 8, Pa.

New Books, Maps and Movies

HOW TO BE A SUCCESSFUL LEADER, Auren Uris, McGraw Hill, New York, $3.50.

Here is a book which provides all executives in management with usable tools for rapid development of their leadership abilities. Part of the book is a detailed discussion of a systematized method for mastering the problems which must be solved to be a successful leader of people. The element of flexibility is stressed; no two people are alike and no two groups alike. Among the topics answered are the key characteristics of a leader, the basic methods of leadership, how to pick the right method at the right time, how to discover individual aptitudes for leadership, and how to analyze yourself as a follower. Uris examines three basic methods of leadership—autocratic, democratic and free rein, pointing out that effective leadership depends not on the choice of any one of these three methods, but on the proper use of each at the proper time and with particular followers.

•

UNITIZATION OF FEDERAL LANDS, LeRoy H. Hines, F. H. Gower, First National Bank Building, Denver, Colo.

While most of the material in this book deals with unitization of Federal lands, Hines has included some definitions and general material which would apply to other unitization projects, both in the case of discovered pools and in exploratory areas. Among the topics covered are reasons for unitization of oil and gas pools, legislative background and statutory authority, what the statutes authorize, exploratory areas, procedure in exploratory areas, benefits and disadvantages of unitizing unexplored areas, cooperative agreements and communitization agreements, as well as other aspects of the subject.

•

PRICE MAKING AND PRICE BEHAVIOR IN THE PETROLEUM INDUSTRY, Ralph Cassady, Jr., Yale University Press, New Haven, Conn., January 27, 1954. $4.

This book, a study of the actual techniques of business rivalry made with the full cooperation of the oil industry, is a detailed analysis of the nature of competition, the economic principles underlying competitive behavior and the complex factors determining pricing at crude, refinery, tank wagon and retail levels. The author shows how individual companies operate in the attempt to wrest business away from one another, how opponents are chosen, how a price war is waged and what legal problems enter into a system of competitive arrangements.

•

GEOLOGY AND MINERAL DEPOSITS OF THE ZOSELL (EMERY) MINING DISTRICT, POWELL COUNTY, MONTANA, Memoir No. 34, Forbes Robertson, Montana School of Mines, Butte, Mont., $1.

Memoir 34 describes the geology and ore occurrence in the Zosell or Emery mining district which has been a noted producer of gold-silver-lead-zinc ores. Total value of precious and base metals produced is said to be not less than $2,175,000, but production has been intermittent. Individual properties are described. The report is well illustrated with maps and photographs of rock and ore specimens and includes a list of patented mining claims showing ownership.

•

FUSULINIDS OF THE CASPER FORMATION OF WYOMING, Geological Survey of Wyoming Bulletin 46, Geological Survey of Wyoming, University of Wyoming, Laramie, Wyo. $2.

The publication of this bulletin culminates more than 15 years of field and laboratory research. The fossils described are known as fusulinids, small marine protozoans shaped like grains of wheat. Twelve species of Pennsylvanian fusulinids and four species of Permian ones are described.

Get more footage at lower cost with

SPANG

ALLOY-STEEL

Weldless Jars

. . . forged from ONE PIECE of Alloy Steel

NO WELDS TO BREAK . . .

Each SPANG WELDLESS JAR is forged from a single piece of selected alloy steel and is scientifically heat-treated and tempered to obtain proper hardness and toughness in the rein sections for maximum strength and wear resistance in the most severe drilling service.

The joints, heat-treated and precision machined, are stronger and more durable, assuring fewer fishing jobs. Records over the years show up to four times more footage with SPANG Alloy-Steel WELDLESS JARS.

For further information on weldless jars, and for FREE CATALOG of other SPANG cable tools, contact your nearest Dealer or write direct to:

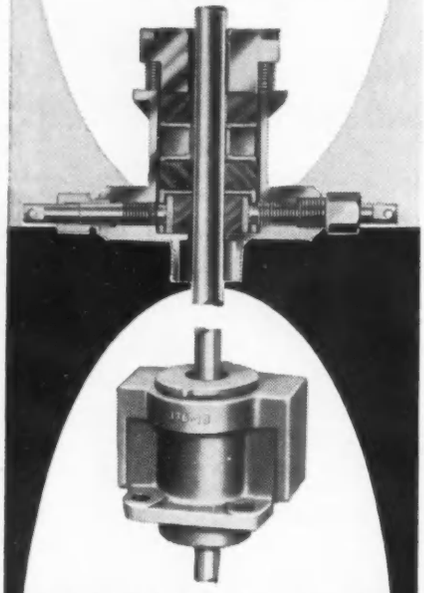
The HIGHER STANDARD

SPANG & COMPANY

DEPT. 0-6 • BUTLER, PENNSYLVANIA

For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

An Ideal
COMBINATION
That Provides
CONTINUOUS LUBRICATION
OF
POLISHED ROD



RATIGAN No. 176
STUFFING BOX
and No. 176-1B Lubricating Cap

Ratigan Stuffing Boxes receive lubrication direct from pumping well when it is not heading while the Ratigan Lubricating Cap lubricates the polished rod when the flow of oil in the tubing is retarded.

SOLD THROUGH LEADING SUPPLY STORES EVERYWHERE

J. P. RATIGAN, Inc.
1213 Santa Fe Ave., Los Angeles 21
Export: National Supply Co., Inc., Export Div.
600 Fifth Ave., New York 20, N.Y.

SQUEAKS from the BULLWHEEL

Mistaken Identity

One of WORLD OIL boys brings back this true story from Arizona:

An eastern lady visiting a dude ranch in Arizona was very much taken with the quaint bird known in the Southwest as the Road Runner or Chaparral. Out on a trip on the ranch with the wife of the ranch owner, the eastern lady suddenly pointed at a Road Runner crossing the trail and exclaimed, "Oh, there goes one of those cute Street Walkers!"

•

So Brave

Two veteran Marines were bragging about their respective outfits. "When we presented arms," said one, "all you could hear was slap, slap, click."

"With us," said the other, "it was slap, slap, jingle."

"Jingle? What was that?"

"Our medals."

•

Triangle

Teacher (in grammar class): "Willie, please tell me what it is when I say, I love, you love, he loves."

Willie: "That's one of them triangles where somebody gets shot."

That's not the type scaffold I had in mind!

Grounds for Divorce

Rastus: "Ah want a divorce! Can't stand livin' wif dat woman nohow . . . she jes' talk, talk, talk, night an' day."

Lawyer: "What does she talk about?"

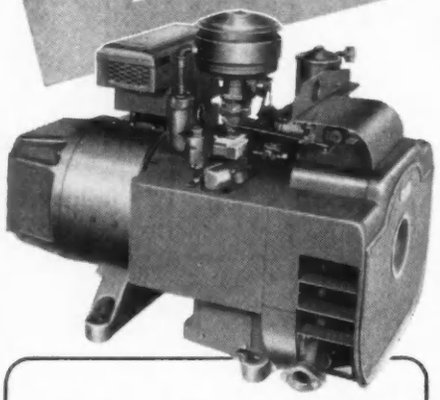
Rastus: "She doan' say!"

10,000 WATTS A. C.

with half the weight!
in half the space!

the New **ONAN "10 CW" ELECTRIC PLANT**

Lowest cost complete plant!



- ★ Twin-cylinder, 4-cycle, horizontally-opposed, air-cooled engine
- ★ Extra-large, replaceable bearings
- ★ Full-pressure lubrication
- ★ High-tension magneto ignition
- ★ Extremely quiet-running
- ★ Completely equipped, ready to run

You can't match it anywhere in performance, equipment or value. The sensational new Onan *10CW* has everything you've wanted in an electric plant plus exceptional mobility for a plant of its capacity.

On large construction jobs where wattage requirements for power tools are high or where floodlighting of extensive work areas is essential, the Onan *10CW* delivers all the electric power you need.

Before you buy another electric plant for any purpose, take a good look at this new low-cost powerhouse! Also available in 5,000-watt capacity.

Write for detailed specifications.

Onan ELECTRIC PLANTS

D. W. ONAN & SONS INC.
5982 University Ave. S.E., Minneapolis 14, Minnesota

What's NEW

In Perforating, Logging, and Fishing Tool Services

McCULLOUGH
NEW SERVICES • NEW TOOLS
NEW WAYS OF DOING THINGS

Latest News About New Tools, Techniques and Services

MORE PRODUCTION

. . . Is only PART OF THE STORY

— IN ADDITION, McCULLOUGH PERFORATING SERVICE OFFERS YOU OTHER ADVANTAGES THAT MEAN LOWER COST, MORE SUCCESSFUL WELL COMPLETIONS.

Here are a few of them:

McCULLOUGH
Perforating Service

Featuring

M-3 (Burrless Bullet) and
GLASS JET Perforators

"WORLD'S FASTEST, MOST EFFICIENT GUN PERFORATING SERVICE"

Our 32-page, illustrated booklet, "How To Get More Oil," gives the full story of how you benefit by using McCullough Perforating Service. If you have not received your copy, send for it TODAY!

SAVES RIG TIME

Simultaneous firing of Burrless Bullets or Glass Jets in single or multiple zone completions — plus record breaking efficiency of McCullough perforating crews and equipment (7752 Burrless holes in 73 hours) save operators thousands of hours of rig time every year. **EXAMPLE:** Shot 136 holes in 4" liner at 6752 feet in one electric wire line run, using McCullough Standard Casing Glass Jet Perforator in 34 foot Steel Strip Carrier. Time on the job — one hour, twenty minutes. Production — 528 barrels per day.

DEEPER PENETRATION

"First time" job completion saves rig time and money. Improved firing power of both the McCullough M-3 (Burrless Bullet) and Glass Jet Perforators gain up to 25% deeper penetration than formerly — even under severest well conditions. More than ever, they are the "hardest shooting perforators in the world." **EXAMPLE:** Excessively thick cement sheath behind 7" O.D., 23 lb. casing. Well previously perforated by two different companies without results. Six shots at approximately 6690 feet with a McCullough Super Casing Glass Jet Perforator and Steel Strip Carrier resulted in 100 B/D—in only two hours rig time.

"PIN-POINT" ACCURACY

Extremely accurate wire line measurements, double-checked by electronic instrumentation, puts the shots where they count. Greatest assurance of successful job completion can be realized by perforating on the reliable information furnished by the McCullough Radiation Well Logger with Scintillometer.

The extreme accuracy of this amazingly efficient instrument will reliably measure, define and interpret the nature of the zone or intervals to be perforated — regardless of thickness. The simultaneous recording of a collar log is a further assurance of "pin-point" accuracy in perforating. For better results — Log AND Perforate by McCullough.

EXAMPLE: Except for a small trace of oil, this well appeared to be dry. However, the McCullough Radiation Well Logger with Scintillometer picked up a four foot stringer of porous limestone at 3013 feet, confined above and below by shale beds. This four foot zone was perforated with 16 holes by a McCullough Standard Casing Glass Jet Perforator. Production — 150 barrels of oil per day from what otherwise might have been a dry hole. Time on the job — only six hours to log and perforate.

PERFORATING, RADIATION LOGGING, AND FISHING TOOL SERVICE—ANYWHERE—ANYTIME.

McCULLOUGH TOOL COMPANY

5820 South Alameda Street, Los Angeles 58, California
405 McCarty Street (P. O. Box 2575) • Houston, Texas

CABLE ADDRESS: MACTOOL
EXPORT OFFICE: Los Angeles, California

CANADA: Edmonton, Calgary, Grande Prairie, Alberta; Regina, Sask.
VENEZUELA: United Oilwell Service Co., S.A.; Caracas, Anaco, Maracaibo

SERVICE LOCATIONS: TEXAS: Houston, Snyder, Alice, Cisco, Corpus Christi, McAllen, Odessa, Tyler, San Angelo, Victoria, Wichita Falls, Luling, Beaumont, Sherman, Midkiff, El Campo. **OKLAHOMA:** Oklahoma City, Guymon, Healdton, Hominy, Wewoka. **ARKANSAS:** Magnolia. **MISSISSIPPI:** Laurel. **NEW MEXICO:** Hobbs. **KANSAS:** Great Bend. **WYOMING:** Casper, Cody, Newcastle. **CALIFORNIA:** Los Angeles, Avenal, Bakersfield, Ventura. **LOUISIANA:** Houma, Lake Charles, New Iberia, Shreveport. **COLORADO:** Sterling. **NORTH DAKOTA:** Williston. **UTAH:** Vernal.

INCREASE PRODUCTION

CLEAN OUT CHOKING SAND

Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less down-time, use world famous Miller Sand Pumps.

PUMP & BAILER SIZES
O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 inches.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3433

Write for descriptive price list.

MILLER SAND PUMPS

MILLER SAND PUMP CO.
General Offices, Box 4516
Oklahoma City 9, Okla.
EXPORT OFFICES
30 Rockefeller Plaza
NEW YORK CITY 20, N. Y.

Pump

Bailer

The NEW Protek CENTRIFUGE

HIGH SPEED
ACCURATE
EFFICIENT

Aluminum alloy castings . . . high strength, light weight. Worm gear drive . . . easier turning, longer gear life. Drive gear of finest bronze. Bearing-supported shafts for proper alignment. Self-lubricated bearings . . . no maintenance necessary. NOW available: Model 152 for 2-15 ml tubes. Model 1002 for 2-100 ml tubes.

Write for literature!

PROTEK
SPECIALTY COMPANY
3340 DIXIE DRIVE
HOUSTON, TEXAS
PHONE: LInden 3988

4813

Well, "Push," the driller said you said to paint something when we're not going in or outa the hole.

Handicap

The doctor rushed upstairs to Mrs. Brown's sickroom. In a moment he came back down, breathlessly asked Mr. Brown, "Have you got a corkscrew?"

Back up he went, then down again. "I'll need a screwdriver," he said.

A third time he went up and down. "Quickly, man, bring me a chisel and mallet."

Mr. Brown was frantic. "Good heavens, doctor, what's the matter with my wife?" he asked.

"Don't know yet. Can't get my medicine bag open."

•

Dream Come True

At the retirement party, the division plant superintendent asked him if any of his childhood dreams had been realized.

"One," he answered. "When my mother combed my hair, I used to wish I didn't have any."

•

Not a Woman's Field

"At any rate," said the auctioneer, "mine is an occupation that a woman can't take up."

"Nonsense," put in a strong-minded lady. "A woman would make as good an auctioneer as a man!"

"Would she?" retorted the other. "Try and imagine an unmarried lady standing up before a crowd and saying, 'Now, gentlemen, what am I offered?' "

•

Could Save More

A young husband realized that it was time to start saving money. He decided not to use the streetcar anymore. One evening he ran behind the streetcar, came home gasping and said to his wife, "Dear, I saved 10c by running behind the streetcar!"

"You're a fool!" his wife shouted. "You could have saved $1.25 by running home behind a cab!"

•

Don't Bother

Husband: "If I'm unable to get back from this trip tonight, I'll send you a note."

Wife: "Never mind. I found the note in your pocket last night."

•

The Brutal Truth

He was a wolf of middle age and playful ways, who seated himself beside the cute blonde. As the bus turned sharply, he took advantage of its motion and leaning close, whispered: "Where have you been all my life?"

"For the first two thirds of it, I was not even born," she replied.

•

Nosey!

"I can't see what keeps you girls from freezing."

"You're not supposed to."

"It's oil....LANE-WELLS on the job."

INDUSTRY'S BIGGEST BARGAIN...

INVOICE

EARLE M. JORGENSEN CO.
STEEL
10650 S. ALAMEDA ST. • PHONE LUCAS 0281
LOS ANGELES 54, CALIFORNIA

TO: **ALL STEEL AND ALUMINUM USERS**

TECHNICAL ADVICE – Trained representatives available at all times to aid in selection of proper materials and solution of production problems. Personal interest in individual applications.	N/C
HELPFUL INFORMATION – Technical literature on all types of steel and aluminum. Complete data on government and industry specifications. Up-to-date information on government regulations.	N/C
SPECIAL HANDLING – Flexible organization geared to meet individual customer's requirements. Efficient handling of emergency shipments and orders involving unusual processing.	N/C
INTRODUCING NEW MATERIALS – Pioneering new steels and aluminum alloys, enabling industry to take immediate advantage of metallurgical advances.	N/C
ESTIMATING – Fast and accurate information on weights, prices, availability.	N/C
EXPEDITING – Solving customers' procurement problems by continuous follow-up of all orders. Servicing direct mill shipments in capacity as mill agent.	NO CHARGE
FOR SERVICES RENDERED	

NO CHARGE

For immediate delivery of STEEL and ALUMINUM from complete warehouse stocks
AND THE MOST IN SERVICE...

CALL Jorgensen FIRST

EARLE M. JORGENSEN CO.
STEEL

HOUSTON	DALLAS	FORT WORTH	TULSA	OAKLAND	LOS ANGELES
5311 Clinton Dr.	2200 W. Commerce St.	Dial	7311 East Pine St.	1657 W. Grand Ave.	10650 S. Alameda
ORchard 1621	Riverside 1761	FOrtune 0578	85-1511	Higate 4-2030	LOrain 7-1122

JET-LUBE
VL-5
VALVE LUBRICANT

WITH MOLY-DISULPHIDE

High temperature, non-melting silica base valve lubricant with low friction moly-disulphide. Use JET-LUBE VL-5 on valves that are hard to turn. Resistant to hydro-carbons, water, acids, sulphur and alkalies. Batch controlled. Fully guaranteed.

Order through your supply store or send for complete details

JET-LUBE INC.

7362 W. BEVERLY BLVD., LOS ANGELES 36

GOING FISHING? . . CALL YOUR FRIEND!

ACME
OIL TOOL COMPANY

- Competent Operators
- Rotary Fishing Tool Service
- Spang Cable Tools • Drill Pipe
- Blow Out Preventers • Rentals
- Complete Oil-Field Machine Shop

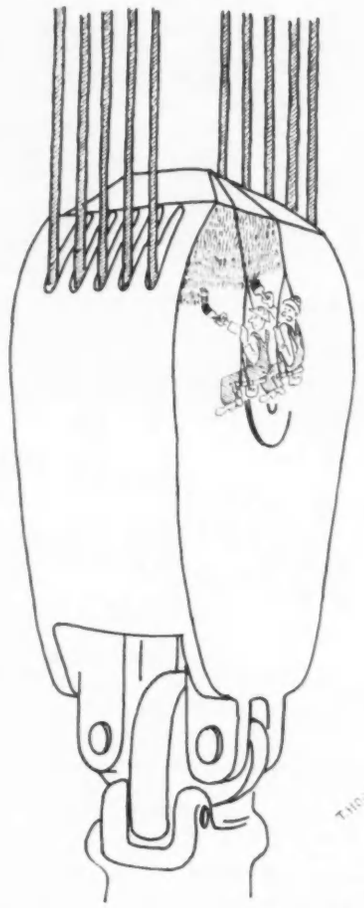
Don't miss . . .
use ACME'S inside Tubing & Casing Cutters!

Oklahoma City
1037 S.E. 29th St.
Phone MElrose 7-2426

Wichita Falls, Texas
4 miles west of town
on the Seymour Road
Phone 3-1910

Affiliated Company
GREAT BEND FISHING TOOL CO.
West 10th St.
Great Bend, Kansas
Phones 7810 - 7819

MFG · RENTALS · ENG · REPAIRS · ACME



Had I known they were gonna' drill them this deep, I'd have chosen another profession, believe you me.

Sherlock Holmes

Walking toward his car parked half a block away, a motorist saw it suddenly pull out from the curb and go speeding up the street with two men in it. The owner yanked a notebook from his pocket, made a notation, hailed a passing motorcycle cop, rushed up to him and reported excitedly:

"Somebody just stole my car! But," he added triumphantly, "I got his license number!"

•

But How?

An officious second looie, just arrived from the States as a replacement in Korea, barked to a tough sergeant, "This man is far too thin to be carrying heavy ammunition. Put him to work cleaning rifles." "Yes, sir," replied the sergeant. "Shall we push him through or pull him through?"

•

Not Interested

The parents were discussing the efficacy of having their unenlightened 9-year-old boy attend the new classes in sex education at his school, and decided to ask his opinion. His answer was sweeping in its scope. "I don't want it," he snapped, "if there's any homework."

•

Best Wishes

The guy enclosed this note in a birthday gift to his gal: "You're a sweet girl. May the Lord bless you and keep you. I wish I could afford to."

A Wee Touch of Lavender

"Yes, madam. What can I do for you today," the salesgirl asked the customer.

"I'm going to be married and want some pajamas. What colors are suited to a bride?"

"White is preferred if it's your first marriage, and lavender if you've been married before."

"Well, let me see some white ones—with just a little touch of lavender."

•

Versatile

In a school in one of the poorer districts of a big city, a questionnaire was sent home with a new pupil requesting information on home environment, number of brothers and sisters, father's occupation and so on.

The next day the child returned with a scrap of paper on which was written, "We have 18 children. My husband can also do plumbing and carpentry work."

Just Off the Press!
1954
OIL DIRECTORIES

13 pocket-size, plastic-bound personnel directories covering the entire oil industry, from top executives to foremen. Over 50,000 key men are listed. First seven books cover Producing and Drilling Contracting.

WE SEND OUR DIRECTORIES ON APPROVAL!

(1) TEXAS (2) OKLAHOMA (3) CALIFORNIA (4) KANSAS (5) MICH.-ILL.-IND.-KY. (6) LA.-ARK.-MISS.-GA.-FLA. (7) ROCKY MOUNTAIN REGION AND NEW MEXICO (8) REFINING, PETROCHEMICAL, AND NATURAL GAS PROCESSING PLANTS (9) PIPE LINE (10) LATIN AMERICA (11) OIL DIRECTORY OF CANADA (12) DIRECTORY OF GEOPHYSICAL AND OIL COMPANIES WHO USE GEOPHYSICAL SERVICE (13) DIRECTORY OF OIL WELL SUPPLY COMPANIES.

THE MIDWEST OIL REGISTER
Drawer 7248—Tulsa, Okla.
C. L. Cooper, Publisher

CONTACT YOUR FAVORITE SUPPLY HOUSE

STANDARDIZE ON
PARMACO PRODUCTS
•
THEY SATISFY
•
PARKERSBURG MACHINE CO. PARMACO PARKERSBURG, W. VA. U.S.A.

The House of Courteous Service

HOUSTON LABORATORIES
Analytical and Consulting Chemists

Hydrocarbon Gas Analyses, Reservoir Equilibria Studies for Crude and Condensate Well, Waters, Brines, Corrosion and Industrial Analyses.

Phone CApitol 1319, Box 132, Houston, Texas

What's New in Equipment

Drilling • Production • Pipe Line

Roller Bearing

Because the bearings in the assembly are seated in tandem along a machine shaft one above the other, the new tandem thrust roller bearing assembly manufactured by Rollway Bearing Company, Inc. gives twice the thrust capacity and eight times the life expectancy of a conventional thrust bearing. Rather than expanding a machine's housing area to accommodate the greater diameters of ordinary high capacity thrust roller bearings, the new tandem bearing asembly utilizes axial space along a machine's shaft.

To obtain such loads in a confined area, two bearings, mounted equally share the thrust load exerted by the machine shaft. Loads as high as 300 tons have been successfully supported by this type of bearing assembly when used on oil drilling swivel shafts. Major components of each bearing are rotatable bearing plate, bronze retainer containing through-hardening steel rollers, a compression sleeve, and a stationary bearing plate.

When one bearing is mounted above the other, with each roller assembly seated between a rotatable and stationary bearing plate and aligned along a compression sleeve, the thrust load from the machine's shaft is transferred to the top bearing plate, where it begins to take two paths; first, the compression sleeve of the top bearing partly bypasses the total thrust load around the top series of rollers down to the bottom series; at the same time, the share of the total thrust load which the top rollers receive directly from the top bearing plate travels downward to the bottom compression sleeve. Illustrated is the view of the two load carrying roller assemblies of a rollway tandem type bearing without spacer sleeves.

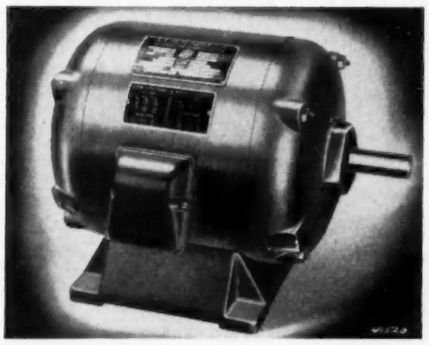
This item supplements Rollway Bearing Company, Inc., data on page 4464 of the Composite Catalog, 19th Edition.

For more data circle No. E1 on Readers Service Card, last page this issue.

Oscillator

The SIE Model MB-1 battery-operated oscillator is now available with a calibrated output attenuator and level meter, the geophysical microvolter, incorporated as an integral part of the instrument. This combination is useful as a "transducer simulator" for field use where it may be connected for test purposes in place of a vibration pickup, pressure gauge, geophone or similar device. Both DC and AC signals are available from .1 volt to 1 microvolt at output impedances of 10 to 500 ohms. The frequency range of the oscillator is 2 to 20,000 cycles per second, calibrated within 2 percent and the distortion is less than one-half of 1 percent in the audio range. Either the oscillator or the attenuator may be conveniently used independently of the other without disassembly. Both instruments are available separately if desired.

For more data circle No. E2 on Readers Service Card, last page this issue.



Integral Horsepower Motors

A new line of integral horsepower motors, designed for economical changeover to the new standards prescribed by the National Electrical Manufacturers Association, has been announced by the Electric Motor Division of the A. O. Smith Corp.

Initial production will be in the one, one and one-half and two horsepower ratings. All performance characteristics of the old and new motor lines will be equal. Contour lines and styling will be the same. Only physical mounting dimensions will vary according to the customer's needs. The new Smith design is composed of rolled steel main frame construction with attached malleable iron base mounting as required. End frames are of durable cast iron and are so constructed as to insure maximum ventilation to working interior parts, yet meet requirements of "drip proof application."

The new line of motors will supplement the present line which extends from one-fourth through 150 h.p. and includes standard models as well as many mechanical and electrical variations from standard to meet customer's specific requirements. One unit in the new line of A. O.

Save time! Keep informed! Circle numbers on Reader Service Cards, last page this issue.

Smith electric motors is the 1½ h.p. four-pole, polyphase motor in 184 NEMA frame illustrated here.

This item supplements A. O. Smith Corp. data on page 4725 of the Composite Catalog, 19th Edition.

For more data circle No. E3 on Readers Service Card, last page this issue.

Self-Priming Pumps

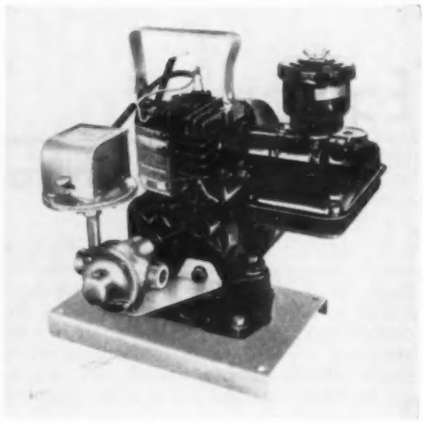
Marlow Pumps has extended its line of vertical self-priming pumps up to 1½ horsepower. With the addition of nine new verticals, the line now includes 23 models with capacities up to 120 gpm. The exclusive Marlow diffuser design enables the pumps to prime and purge themselves automatically even on suction lifts. A self-lubricating shaft seal eliminates drip, reduces maintenance to a minimum. New models are available in 1½-inch and 2-inch sizes with ⅓ to 1½ horsepower, single or three phase, open or explosion proof motors.

This item supplements Marlow Pumps data on page 3196 of the Composite Catalog, 19th Edition.

For more data circle No. E4 on Readers Service Card, last page this issue.

Portable Pump

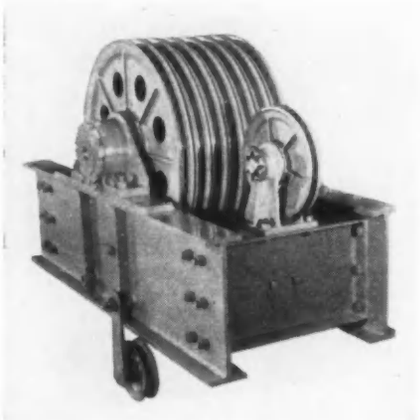
The hollow shaft pump, Model G 3800 VS designed for oil or water transfer by Hypro Engineering, Inc., mounts directly on the drive shaft of Model 5S 1 h.p.



Briggs & Stratton gasoline engine and will run for 1¾ hours on a tank of fuel. The unit shown is equipped with a special vacuum switch to guard against burned out impellers when the liquid supply runs dry. Use of the switch means that the pump may be operated untended and will shut itself off when the pumping job is finished. Capacity of the pump is up to eight gallons per minute open discharge. Pressure range of the pump is up to 30 pounds. It will lift water up to 10 feet unprimed, 22 feet primed and has outside threaded ports to accommodate hose couplings. It will handle a wide range of liquids on transfers or booster pumping duty.

For more data circle No. E5 on Readers Service Card, last page this issue.

DRILLING



Crown Block

An Ideal Type F Crown Block has been designed by The National Supply Company as companion equipment to its 450-ton Type F Universal hook-block and Universal traveling block. The new crown block is rated at 525 tons based on a suspended load of 450 tons and dead line load of 75 tons. Designated as Type 754-F, it has seven 54-inch diameter sheaves and is suitable for all deep drilling.

Each sheave is individually mounted on a Timken double row tapered bearing. The sheaves are mounted in line and held in fixed lateral position, no spacers being required. The sheave grooves are flame-hardened, with wide flare.

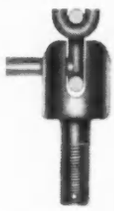
Sheaves of the crown block are size-matched with those of the mating hook-block or traveling block, permitting maximum use of derrick space without flare of the lines. They are normally furnished for 1⅜-inch line, but can be grooved for 1½-inch line if preferred. The Type F crown block has a narrow overall design, providing a greater proportionate strength to weight ratio. All parts and fittings are securely locked. A sand line sheave attachment is available as optional equipment.

This item supplements The National Supply Co. data on pages 3589-3720 of the Composite Catalog, 19th Edition.

For more data circle No. E6 on Readers Service Card, last page this issue.

Adaptor

The new L-K Swivel spinninng chain adaptor is designed to accommodate the use of any size spinning chain to any L-K Swivel. After the chain ring is removed, the interchangeable adaptor is fitted in place. The end chain ling of the spinning chain is inserted in the slotted end of the adaptor and a drive drift pin is put in place holding the link. The chain can easily be removed when necessary by driving the drift pin out. The adaptor is fully ball bearing and has the same tested strength as the swivel. The heat treated alloy steel drift pin has more than three times the strength of the regular spinning chain. L-K Swivels sell with the adaptor instead of the chain ring at the same price.



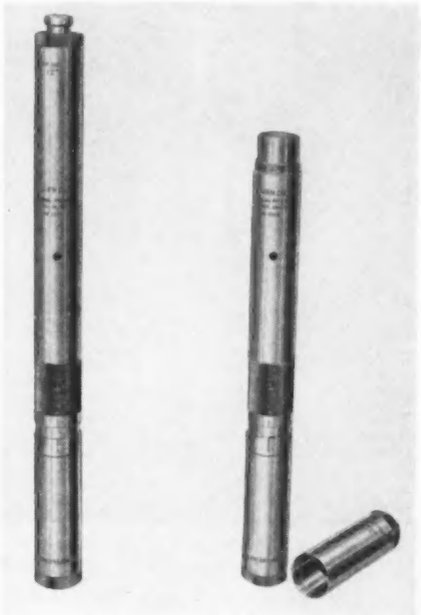
This item supplements L-K Pump Valve Company data on pages 2870-2879 of the Composite Catalog, 19th Edition.

For more data circle No. E7 on Readers Service Card, last page this issue.

Directional Survey Instrument

The Genco directional instrument for deep well surveying is a precision-made, easy to operate mechanical instrument. It is a single-shot instrument with controlled timing mechanism which records drift and direction within two minutes after reaching the bottom of the well by means of the plumb-bob punching the chart paper. Genco's special features of a locked plumb-bob and compass mechanisms eliminate inaccurate recordings caused by vibration

Save time! Keep informed! Circle numbers on Reader Service Cards, last page this issue.



and thus assure greater accuracy.

Its full mechanical construction eliminates any possibility of faulty recordings that would be caused by weak batteries or film fogging. Genco is made of a non-magnetic metal with a low co-efficient of thermal expansion enabling operation under high temperature conditions. The Genco uses a simple chart paper which gives an immediate reading without developing or using any complicated chart reading holder. Any member of the drilling crew can operate a Genco instrument without any special training.

For more data circle No. E8 on Readers Service Card, last page this issue.

Speed Selector

The Martin-Decker Ideal speed selector is an instrument for selection of most efficient drawworks hoisting speed. It interprets the tension in the dead line, indicates the proper speed ratio for hoisting and can be easily read since it is mounted in the weight indicator panel.

The speed selector avoids the use of speed ratios which are too high for the load with consequent overloading of chains, clutches and engines; use of speed ratios which are lower than the load requires with subsequent loss of time; and use of power beyond the rating of the drawworks, on rigs using extra power for pumping requirements.

The instrument is provided with bracket, bolts, built-in pulsation dampener, self-sealing disconnecting couplings, hose and a tee for installation in the Martin-Decker instrument panel. Each speed selector is calibrated for a particular combination of drawworks and wire line anchor. Its use is recommended only for the Ideal Types D, E and F anchors. With the speed selector, it makes no difference how many lines are strung on the blocks since the calibration is based on the tension in a single line.

This item supplements Martin-Decker Corporation data on pages 3197-3244 of the Composite Catalog, 19th Edition.

For more data circle No. E9 on Readers Service Card, last page this issue.

Collapsible Kelly

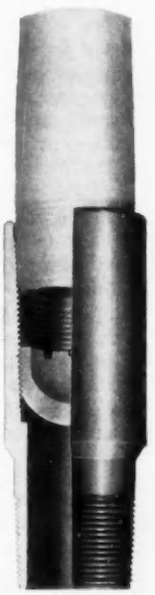
The new "Trahan" collapsible kelly designed and manufactured by the Henderson Welding Works is capable of performing all the duties of the regulation kelly and has features which make it a useful tool to the oil industry in workover jobs. The kelly's compactness in collapsed position permits it to be transported without special handling or packing as required by the regulation kelly. The operator is able to have complete well control using the "Trahan" with a stripper type preventer and packoff is effective around tubing at all times; this also permits control of fluid so that it can be directed into mud tanks on top of the ground. In operation the tool clamps directly on tubing and fits into any size rotary table. In extended position, the tool is approximately 75 inches overall and when pipe is lowered approximately 60 inches in the hole, the tool is released from tubing and extended to an open position by use of cat-line and new grip is taken on the tubing.

For more data circle No. E10 on Readers Service Card, last page this issue.

PRODUCTION

Flo-Starters

When used in the completion string, the Gulf Flo-Starter eliminates the necessity of swabbing, and when used in combination with desired type packer, a simple low cost drill stem test is possible.



The instrument may be run at any level desired in the tubing string above the packer. Water cushion may be run above or below, or both above and below, the tool. When the tool is run with minimum or no water cushion, it further serves to surge the well production on the initial flow, thus breaking down tight, mudded off and low porosity formations.

In operation the flo-starter is made up in the string above the packer and suitable tail pipe with plug or catcher is run to the bottom. After the packer has been set and the proper well head connections made, a small bar is dropped through the tubing which shatters the metal plug and releases the formation fluid to the tubing string.

This item supplements Gulf Tool Company, Inc. data on page 2221 of the Composite Catalog, 19th Edition.

For more data circle No. E11 on Readers Service Card, last page this issue.

Flow Bean Parts

The wear-resistant qualities of Kennametal cemented carbide have proved advantageous when excessive sand cutting, corrosion and electrolytic action are prevalent in flow beans. In "positive" flow beans, Kennametal carbide is incorporated in the form of a core tube inside the solid steel body, making this core tube or replaceable bushing act as a flow bean orifice. In the "adjustable" flow bean, Kennametal is used as a cone or needle body brazed on the valve and a ground seat in the form of a removable bushing in the valve body. In principle, this is a modified needle valve with a calibrated disc mounted on the valve stem for direct reading of the measured opening of the needle in relation to the valve seat.

For more data circle No. E12 on Readers Service Card, last page this issue.

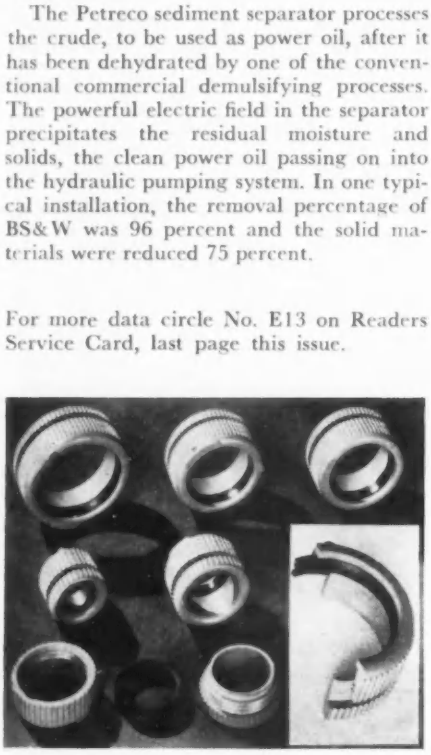
Save time! Keep informed! Circle numbers on Reader Service Cards, last page this issue.

Sediment Separator

The Petreco division of the Petrolite Corporation has announced the development and commercial application of an electric sediment separator for the purification of hydraulic pumping system power oil. In commercial use, the Petreco separator has reduced the BS & W and sediment content of power oil for hydraulic pump systems to such a low percentage that engine end efficiency has been substantially increased. On one lease where sediment in the power oil had necessitated pump pulling and repairs every four or five months, the production engineers estimate that pumps will now have to be pulled only once in three years, and then primarily to insure against "freezing" in the well.

The Petreco sediment separator processes the crude, to be used as power oil, after it has been dehydrated by one of the conventional commercial demulsifying processes. The powerful electric field in the separator precipitates the residual moisture and solids, the clean power oil passing on into the hydraulic pumping system. In one typical installation, the removal percentage of BS&W was 96 percent and the solid materials were reduced 75 percent.

For more data circle No. E13 on Readers Service Card, last page this issue.



Plastic Clamp

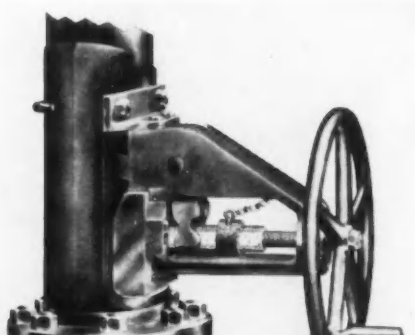
A molded plastic clamp made by Carlon Products Corporation is used to effect a tight, permanent seal when sections of flexible plastic pipe are connected by means of insert couplings, tees, ells and adapters. It is slipped over the pipe ends and tightened to force them down onto the serrations incorporated in insert fittings to create a leakproof connection.

The new clamp incorporates the same principle used in the compression coupling developed for rigid Carlon plastic pipe. It is molded in two separate threaded sections. Butted against a shoulder at the base of the female threads in one half is a synthetic gasket with a V-shaped groove. When the other half of the clamp is screwed down onto this gasket, it is forced against the pipe. Consequently a full 360 degree pressure is exerted on the pipe to make it grip the insert fittings tightly. Connections made in this way are stronger than the pipe itself.

This clamp is impervious to rot, rust and electrolytic corrosion and can be used in most adverse conditions. When the unit is positioned, the specially compounded gasket is completely enclosed by plastic and thus protected from fluids, ozone and other deteriorating forces.

For more data circle No. E14 on Readers Service Card, last page this issue.

PIPE LINE

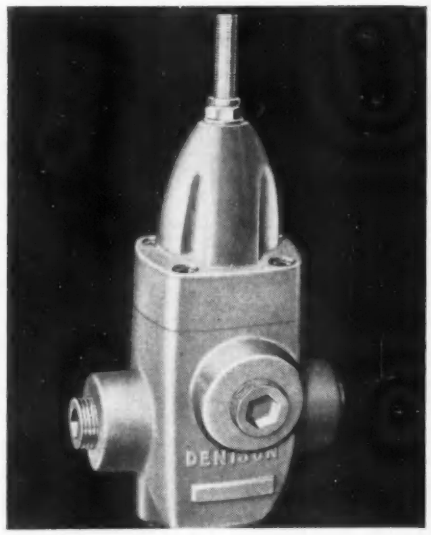


Side Handwheel

A new type Y continuously connected side handwheel for emergency manual control in case of diaphragm or operating medium failure has been introduced by Black, Sivalls & Bryson, Inc. Designed for use with all BS&B diaphragm control valves, the new handwheel enables a plant to operate on an emergency basis. The basic handwheel assembly has a high tensile iron frame fitted with oil impregnated bearings. The handwheel screw is made of non-galling 18-8 stainless steel with a high tensile aluminum bronze nut for transmitting power through a cast steel fork to the valve stem.

When equipped with the Type Y handwheel, BS&B control valves can be manually positioned in either direction independently of the normal controlling impulses. The handwheel mechanism provides stops so that travel can be set to cover any portion of the complete valve stroke.

For more data circle No. E15 on Readers Service Card, last page this issue.



Sequence Valve

The newly announced line of direct-operating controls by The Denison Engineering Company includes a complete line of direct-operating sequence valves suitable for operation in circuits from 25 to 2000 psi. The line provides precision control for inter-locked hydraulic operations, insuring close synchronization of primary and secondary operations. The pressure setting of the valve is easily adjusted. When system puressure reaches the pressure setting of the valve, the valve diverts oil to the secondary circuit.

Pressure build-up in the system brings immediate action of the pilot piston in the secondary circuit, which may be adjusted to shift at any pressure from 25 to 2000 psi. The use of the small pilot piston eliminates need for heavy spring loading at high pressures. The secondary operation begins immediately when the pressure reaches the presetting of the valve. These sequence valves are externally drained direct to tank.

These sequence valves designed for operation in the 25 to 125 psi and 75 to 250 psi ranges do not utilize the pilot piston. The pilot pressure is directed against the large area of the spool. This results in extreme sensitivity to pressure changes in the low pressure ranges. Any number of Denison direct-operating sequence valves may be used in the system, either in series or parallel, permitting control of several sequencial operations performed simultaneously or in proper sequence with one another. Valves are adaptable to a variety of remote control operations by rearrangement of pipe plugs.

For more data circle No. E16 on Readers Service Card, last page this issue.

Save time! Keep informed! Circle numbers on Reader Service Cards, last page this issue.

New Catalogs and Equipment Literature

Coaxial Cable

Phelps Dodge Copper Products Corporation has issued a color bulletin on the company's styroflex coaxial cable, which has application in the microwave communications field. Properties of the semi-flexible, aluminum sheathed cable and electrical characteristics, summarized in table form, are given. This publication also is illustrated with cut-away drawings, tables, and charts. The styroflex coaxial cable, developed for high power, low-loss cable in long lengths for applications in the AM, FM, TV and Microwave fields, is aplicable to the pipe line industry.

To get a copy, circle E17 on Readers Service Card, last page of this issue.

Multimatic Rotary

Operating features of the Ideal multimatic rotary are described in a bulletin of The National Supply Company. The design of this multi-purpose machine is said to make the work of the drilling crew easier; to give faster operation for quicker round trips and casing jobs; makes operation less hazardous, because there are no slip attachments, side mounts or overhang to contribute to floor disorder. Construction features and design specifications are given in the bulletin.

To get a copy, circle E18 on Readers Service Card, last page of this issue.

Data Tables

A catalog and new book of engineering data tables is available from Stainless Welded Products, Inc. The catalog covers the line of SWEPCO large diameter, corrosion resistant pipe, tubing and welding fittings. Sections on special metals and alloys, grades and finishes, size and length tables, weight tables, standard tolerances and dimensional charts are included.

To get a copy, circle E19 on Readers Service Card, last page of this issue.

Vertical Turbine Pumps

Vertical turbine pumps for handling all petroleum products and other volatile fluids are described in a new bulletin published by Layne & Bowler, Inc. Capacities of these pumps range from 40 gallons per minute to 4000 gallons per minute and more for special service requirements. They are manufactured in two types. The Layne standard pump has suction below grade and discharge above grade for pumping volatile fluids from underground storage tanks. The Layne line-flo pump, with both suction and discharge above grade, is for direct fuel transfer using minimum installation space.

To get a copy, circle E20 on Readers Service Card, last page of this issue.

Wire Rope

Stretching the life span of wire rope is the subject of a new booklet, "Wire Rope, Use and Abuse," issued by the E. H. Edwards Company. Third in a series, the pamphlet lists some of the common abuses of wire rope and how to prevent them. It follows two other books by the Edwards Company on the production and selection of wire rope.

To get a copy, circle E21 on Readers Service Card, last page of this issue.

Rust Preventives

Rust-Oleum Corporation has issued a new 1954 general catalog with a treatise on rust prevention. The new catalog features 94 color chips of Rust-Oleum products and includes complete instructions for surface preparation and application of Rust-Oleum primers, short oil type, long oil type, machinery and implement finishes, chemical and heat resistant types, sealers, oil field finishes, thinning oils and floor and masonry coatings.

To get a copy, circle E22 on Readers Service Card, last page of this issue.

Extreme Line Casing

Spang-Chalfant, Division of The National Supply Company, has issued a new bulletin explaining the features and advantages of Spang extreme line casing. This graphic bulletin is an addition to the file on Spang tubular products.

To get a copy, circle E23 on Readers Service Card, last page of this issue.

Air Heater

Peabody Engineering Corporation, has released a new six-page air heater bulletin. Printed in seven colors, the new bulletin describes in print and flow diagrams, not only the operation of the Peabody air heater, but typical applications. The Peabody Cylindrical Furnace Air Heater is widely used throughout the process industries for spray drying, liquid concentrating, rotary drying and petroleum refining.

To get a copy, circle E24 on Readers Service Card, last page of this issue.

Turbo-Charged Compressors

Clark Bros. Co. has available a new bulletin on turbo-charged compressors. The illustrated brochure describes features of the Clark Model TRA-8 which is available in five sizes.

To get a copy, circle E25 on Readers Service Card, last page of this issue.

PERFORATE TUBING IN THE WELL

KINLEY TUBING PERFORATOR

M. M. Kinley Company Licensees

BEAUMONT
Associated Engineers, Inc. 5-7046, ZF 8-2023
CASPER
Wire Line Service 3-5264
CORPUS CHRISTI
Tubokut Wire Line Service 5-1811
Tuboscope 3-3512, 4-3137
HOBBS
Cecil Horne 3-5396
HOUSTON
Tuboscope JU-0577, MO-4279
KILGORE
Tuboscope 5198, 5218
MIDLAND
Luccous 4-8471, 4-4320
NEW IBERIA
Tuboscope 2-3831, 4-1327
NEW ORLEANS
Associated Engineers, Inc. AU-7696
OKLAHOMA CITY
Rainbo Service Co. . . . ME 4-2131, ME 2-2024
SHREVEPORT
Tuboscope 2-5663

Circle numbers on Reader Service Card, last page this issue.

Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current 19th (1952-53) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

A

• Acme Oil Tool Co. 274b
• Advance Oil Tool Co. 208a
Aero Service Corp. 253
Alexander Shipyard, Inc. 262a
• Allis-Chalmers Manufacturing Co. 232-233
• American Cable Division
American Chain & Cable Co. 117
American Foreign Insurance Assoc. 42
• American Iron & Machine Works Co. 127
• American Sand-Banum Company 154a
American Steel & Wire Division
United States Steel Corp. 86
• Anchor Coupling Company 113
Armour & Company 179
Avondale Marine Ways, Inc. 54
• Axelson Manufacturing Co. 171

B

• B & W Incorporated 164a
• Baash-Ross Tool Co. 25
Bakelite Co. ..... 95 and 225
• Baker Oil Tools, Inc. ..... 175 and 246-247
• Baroid Sales Division
National Lead Company 109-110
The J. B. Beaird Company 39-40
• Beaumont Iron Works Co. 129
• Beaver Pipe Tools, Inc. 229a
• Bethlehem Steel Co. ..... 75 and 163
• Bethlehem Supply Co. 149
• S. R. Bowen Co. 151
Bradford Chemical Co. 204a
• Brown Oil Tools, Inc. 188-189
• Bucyrus-Erie Company 30
Butler Manufacturing Co. 213
• Byron Jackson Co. 34-35

C

Cable Engineering 258a
• Camco, Inc. 177
Cardinal Chemical, Inc. 267
• Cardwell Manufacturing Co. 33
Carlon Products Corp. 36
Caterpillar Tractor Company ..... 155-156 and 227
• Clark Bros. Co. 14-15
• The Colorado Fuel & Iron Corp. 261
Columbia-Geneva Steel Division
United States Steel Corp. 86
• Continental Motors Corp. 48
The Continental Supply Co. ..... 50-51, 89 and 147
• Fred E. Cooper, Inc. 187
Core Laboratories, Inc. 131
• Crane Company 18
W. H. Curtin & Co. 154b

D

Delta-C & S Air Lines 60
• Detroit Diesel Engine Division
General Motors Corp. 259
Dowell Incorporated 64
• Dresser Industries, Inc. ..... 19-20 and 21
• Dresser Operations, Inc. 14-15
• Drilling & Service, Inc. 133

E

• Eastman Oil Well Survey Co. 135
• Emsco Manufacturing Co. 89

F

• Fairbanks, Morse & Co. 202
• Fluid Packed Pump Co. 183-184
France Packing Company 218c
• Frontier Industries, Inc. 58

G

• Garrett Oil Tools, Inc. 196-197
• Gaso Pump & Burner Mfg. Co. 219
• General Motors Corp. 259
General Geophysical Company 99
The Geolograph Company 162b
Geophysical Survey Syndicate 262b
The B. F. Goodrich Company 13
• H. P. Gott Manufacturing Co. 164b
• Grove Regulator Company 28
• The Guiberson Corp. 209
• Gulf Coast Machine & Supply Co. 191
Gunite Concrete & Construction Co. 236a

H

• Halliburton Oil Well Cementing Co. ..... 1 and 85
• Harbison-Fischer Manufacturing Co. 199
• Herb J. Hawthorne, Inc. 118
Houston Laboratories 274e
• Hughes Tool Company ..... 237 and 284
Humble Oil & Refining Co. 260
• Hydril Company 145

I

The International Nickel Co. ..... 23 and 52

J

Jefferson Chemical Co. 97
• Jensen Brothers Manufacturing Co. 216
Jet-Lube, Inc. 274a
• Jones & Laughlin Steel Corp.
Supply Division 9
Earle M. Jorgensen Co. 273

K

• K & G Oil Tool & Service Co. 32
Kaiser Steel Corp. 235
Kennametal Inc. 210
Kimco Co. 206
• King Oil Tools 162a
M. M. Kinley Co. ..... 258b and 279
• Kinzbach Tool Co. 8
• Kobe, Inc. 19

L

• Lane-Wells Company ..... 61, 93, 245, 272c and 283
• Larkin Packer Co. 166
• The Layne and Bowler Co. 31
• LeRoi Co. 70-71
• Link-Belt Co. 7
• Lucey Export Corp. 45
• Lufkin Foundry & Machine Co. 181

M

• Magnet Cove Barium Corp. 2
• Manzel
Division of Frontier Industries, Inc. 58
Marine Products Co. 218b
• Jas. P. Marsh Corp. 38
John N. Martin, Manufacturer 214
• Martin-Decker Corp. 141
• McCullough Tool Co. 271
• McKissick Products Corp. 266
The Mercoid Corp. 208b
The Midwest Oil Register 274c
• Miller Sand Pump Co. 272a
• Mission Manufacturing Co. 142-143
Mixing Equipment Co. 159

N

National Aluminate Corp. 255-256
The National Bank of Commerce 73
• National Lead Co. 109-110
• The National Supply Co. ..... 26-27 and 79-82
• National Tank Co. 173
National Tube Division
United States Steel Corp. 16
• W. C. Norris, Manufacturer, Inc. 193

O

• Oil Center Tool Co. 119
• Oil Well Supply Division
United States Steel Corp. ..... 10 and 12
• D. W. Onan & Sons, Inc. 270b
• Otis Pressure Control, Inc. 195

P

• Page Oil Tools, Inc. 205
Parkersburg Machine Co. 274d
• Perforating Guns Atlas Corp. 115
Petroleum Electric Power Assoc. 211
Petroleum Equipment Suppliers Assoc. 46-47
Pittsburgh Coke & Chemical Co. 55
Precision Radiation Instruments, Inc. 100
Protek Specialty Co. 272b
Pur-O-San Co. 204a

R

• J. P. Ratigan, Inc. 270a
• Rector Well Equipment Co. 207
• Reda Pump Co. 218a
• Reed Roller Bit Co. 137-138
• Regan Forge & Engineering Co. ..... 44 and 107
Republic National Bank of Dallas 49
• Republic Steel Corp. 160-161
• The Ridge Tool Co. 263
• Rockwell Manufacturing Co. 56-57
• Rolo Manufacturing Co. 154c
The Royal Bank of Canada 254

S

• Sargent Engineering Corp. 215
• Schlumberger Well Surveying Corp. 201
The Second National Bank of Houston 22
• Security Engineering Division
Dresser Operations, Inc. 20-21
Seismograph Service Corp. 105
• Shaffer Tool Works 43
• A. O. Smith Corp. 231
• H. C. Smith Oil Tool Co. 153
Southern Engine & Pump Co. 204b
• Spang & Co. 269
• Stewart & Stevenson Services, Inc. 29

T

• Technical Oil Tool Corp. 120
• Thompson Tool Co. 157
• Thornhill-Craver Co. 53
• Tretolite Co. 165

U

Union Carbide and Carbon Co. ..... 95 and 225
United Geophysical Co. 238
• United States Rubber Co. 37
United States Steel Corp. ..... 10, 12, 16 and 86-87
United States Steel Export Co. ..... 16 and 86-87
• Universal Atlas Cement Co. 62

V

The Vapor Recovery Systems Inc. 234
• Visco Products Co. 11
J. H. H. Voss Co. 236b

W

• W-K-M Company 76
Wagner Electric Corp. 24
Warren Automatic Tool Co. 158
• Waukesha Motor Co. 41
• Well Equipment Mfg. Corp. 217
William Brothers 229b
• Wilson Foundry & Machine Co. 59
• Wilson Manufacturing Co. 125
• Worthington Corp. 17

Y

The Youngstown Sheet & Tube Co. 220